

3-4. Basic Design

3-4-1 Design Policy

Taking account of publicness and social roles of the radio broadcasting, special conditions in the Kingdom of Nepal, easy operation and maintenance, economization and an appropriate and adequate scale, design should be made with the following items as the basic policy:

- (1) The facilities shall be strong and durable enough to withstand disasters.
- (2) It is necessary to standardize the system to effect easy and economical operation and maintenance.
- (3) The facilities most suitable for the project shall be provided so as to acquire the most effective results within the framework of assistance.
- (4) Equipment and construction work methods most suitable for the purpose of the facilities and a limited completion period shall be employed.
- (5) Due consideration shall be given to the future expansion of the facilities.
- (6) Equipment specifications shall be in accordance with the technical standards of the International Radio Consultative Committee (CCIR) and equipment shall be designed so as to be safe and solid both mechanically and electrically.
- (7) Matters registered at the International Frequency Registration Board (IFRB) shall be observed in accordance with "REGIONAL AGREEMENT - Concerning the Use by the Broadcasting Service of Frequencies in the Medium Frequency Bands in Regions 1 and 3 and

in the Low Frequency Bands in Region 1" concluded in Geneva 1975 at the Regional Administrative LF/MF Broadcasting Conference.

- (8) For introduction of remote control and automatic control, it is necessary to secure highly reliable control circuits and stable power supply, but both seem difficult for the proposed sites. In addition, persons are required for programme production at the stations having a studio, thus each station shall be manned.

3-4-2 Broadcasting Facilities

Main factors and elements related to the design of broadcasting facilities are as follows:

(1) Transmitter

As the output power registered at IFRB shall be applied to the main transmitter, Surkhet Station shall have 100kW power, Dhankuta Station 100kW, Dipayal Station 10kW and Dhalkebar Station 10kW. And a standby transmitter is provided to secure broadcasting even if the main transmitter is in trouble.

Standby transmitter power in each station shall be 10kW, taking into account economy and efficiency in view of installation cost of a standby system for a transmitter and power source, trouble frequencies, service areas in the case of trouble, as well as uniformity of the system used.

Vacuum tubes are employed this time for the last stage high power section of the transmitter used, but solid-state circuits shall be employed for the other sections, thus attempting to improve reliability of the transmitter. Lightning may often be attracted to the transmitting antenna since it protrudes high into the air. Since the transmitter is connected to this antenna, the output section shall be provided with a protective

circuit such as a surge protector so as to avoid the influence of lightning.

Programme input equipment to the transmitter and a monitor shall be installed in racks systematically. Important operational conditions, trouble indications, operation & shutdown of the transmitter, switchover from the main unit to a standby unit, etc. shall be controlled and monitored as a whole on a control monitoring console, thus easy operation can be expected.

(2) Antenna system

The antenna mast shall be 120m high for Surkhet, 120m high for Dhankuta, 60m high for Dipayal and 60m high for Dhalkebar in accordance with the heights registered to IFRB.

The same antenna mast in fundamental structure shall be used for all the four stations. Structural design against wind pressure shall be made based on a maximum instantaneous wind velocity of 45m/sec (10m above the ground), but structural analysis and design are to be made with reference to the Building Standard Law, its related regulations and various structural design standards specified by the Architectural Institute of Japan. The base is insulated with a base insulator and a spherical bearing is installed in the base insulator so as not to apply a detrimental force to it. These are placed on top of an independent base made of reinforced concrete above 2m above the ground.

Guys supported in three directions are fixed to three anchor blocks made of steel frame structure concrete. Insulators are inserted into each guy at an appropriate interval, and the insulators of the highest stack guys are provided with choke coils so as to make DC coupled with ground and prevent an abnormal voltage being generated when lightning strikes.

The mast top is provided with a top hat to extend the effective length of the transmitting antenna.

For the antenna to be marked as an aeronautical obstruction at night, aeronautical obstruction lights are fitted to the top and other points of the mast. In addition, to be marked in the daytime, the antenna mast is painted red and white alternately dividing it into seven sections.

The earth plays an important role in the radiation of medium frequency radio waves. In other words, the earth acts to return the antenna's current, and its efficiency gets worse due to the loss taking place there (ground loss). Accordingly, a radial earth is installed so as to minimize ground loss as much as possible. It is preferable that the scale in radius be 0.3 wavelength to 0.5 wavelength. In this Project also, a radial earth is taken as 0.3 wavelength as long as the site size permits, and 120 copper wires are buried in the earth radiately about 30cm below GL.

Feeder lines are of two types: aerial feeder and coaxial cable. Technical advantages of the coaxial cable are that it has no external wave radiation, and, unlike the aerial feeder, no fluctuation of impedance and output due to winds. Also the circuit component for removing higher harmonics is simple. In terms of material costs, however, the coaxial cable is about twice as expensive as the aerial feeder, for a 10kW station and about 8 times for a 100kW station if constructed under a standard specification. If trouble happens in the aerial feeder, it can be solved by partial replacement of the copper wire which is obtainable relatively easily even in Nepal, whilst entire replacement is necessary for the coaxial cable. In short, the coaxial cable system has major drawbacks, and hence in this Project, 6-wire aerial feeders are employed which are superior in cost and maintenance.

A circuit is required for electrical matching between the transmitting antenna and transmitter, and a tuning unit hut to accommodate the above is installed around the antenna base. The tuning unit hut is electrically shielded inside and outside, thus its inside is lined with aluminum. The hut should be of the minimum required size to accommodate the matching unit, thus being 2m x 5m.

(3) Programme Transmission Line

Telephone lines shall basically be used to transmit the broadcasting programmes from Kathmandu Station to each station.

Three telephone lines are required for radio programme transmission to satisfy its frequency band, and the transmitting side is provided with terminal equipment to divide audio signals electrically into three telephone lines and the receiving side with terminal equipment to convert the divided signals into one signal. And an all-wave receiver and receiving antenna shall be provided to receive off-air programmes of MW broadcasting from other stations or SW broadcasting from Kathmandu Station and rebroadcast them, as a standby system when the telephone network is in trouble.

Janakpur is the nearest place to the existing telephone line available to Dhalkebar Station, but it being about 30km away, it will cost too much to extend the telephone line to the site. Therefore VHF radio link shall be considered.

(4) Power Source

Power in each station shall be basically supplied from a commercial power source. Power supply for required capacity shall be made via an 11kV power line, and the site is provided with a receiving transformer to step-down from 11kV to 400V/230V (3 phases/4 lines). The power source system for the

broadcasting equipment should be provided with an automatic voltage regulator to cope with a wide voltage fluctuation.

A standby generator having the capacity required for the continuation of broadcasting is provided to cope with troubles such as commercial power failures. For this, a 100kVA generator is provided to operate a 10kW transmitter, taking economy for the transmitter into consideration. Likewise, Dhankuta Studio is provided with a 20kVA generator. A main fuel tank capable of keeping fuel for one week to ten days should be installed taking into account a duration time of interruption and a supply frequency. Batteries and a charger are provided but batteries for emergency lighting are not included. Several pieces of emergency lights of independent type are provided.

(5) Studio

The studio will be provided with a minimum of functions required for broadcasting and collection of news and local topics as programme production centre in the Development Region.

A mixing console is of eight channels to mix the following eight inputs:

microphone	1
open reel tape recorder	2
cartridge tape recorder	2
cassette tape recorder	2
disc player	1

Three types of the tape machines are prepared for various programme materials and two sets (each for replaying and recording) are provided to make tape editing possible for each type. A disc player has been used less frequently in recent years but Radio Nepal is keeping many discs stored, which may be used again, thus a minimum of one set is provided. An announcer cough box is a device to shut down sounds by an announcer (e.g. in coughing) and one set of this is provided. An announcer desk

so designed as not to produce noise from paper sliding is also provided.

A monitor speaker per studio and per sub-control room, totalling two sets, are provided. The required numbers of microphones and microphone-stands are also provided.

(6) Outside Broadcasting Van

An outside broadcasting van is provided to supplement the limitations imposed on studio recording and collect local information actively. It should be a 4-wheel drive car as big as jeep in view of road conditions. Modification of the car should be avoided as much as possible with the exception of the mounting of a roof deck on which men can get, shelves to accommodate equipment & parts, a device to connect to a DC power source and a VHF radio to communicate with the station.

Mounted equipment should be basically of a DC power source (battery) driven type (portable) for collection of programme sources. A mixing console should be connected with up to four microphones so as to record talks and folk songs. Two sets of compact recorders (to make the editing on site possible if required) are provided.

Commercial power is required for charging the DC power source, but two sets of compact generators (500w) are provided for activities in areas where commercial power is not available.

(7) Measuring equipment

An appropriate maintenance service is necessary to maintain the equipment in good condition. Measuring devices capable of checking the equipment conditions precisely are required for such maintenance service. Solid and reliable instruments easy

to use shall be provided in accordance with necessary maintenance items.

(8) Maintenance Tools and Vehicles

The following tools shall be provided:

Tool sets for broadcasting equipment comprising drivers, compact spanners, pincers, pliers, cutting nippers, soldering irons, etc.

Electric drills, a vacuum cleaner, a vice, a dust blower, etc. taking frequency of use into consideration.

Set spanners, pipe wrenches, a chain block, etc. for generators.

Vehicles are essential in Nepal where the transport system is not well-developed yet. One maintenance vehicle equipped with a VHF radio shall be provided for each station so that they can cope with an accident, buy goods necessary for routine maintenance and coordinate with persons concerned. In addition, difficulty in procurement of vehicles in Nepal was also taken into consideration.

(9) Ancillaries and Others

In addition to the above mentioned equipment, the following equipment required for the broadcasting stations shall be provided:

Communication equipment:

Interphone type equipment for communication between main manned rooms

Clock:

Battery-powered wall clocks in main manned rooms

VHF engineering link radio and antenna:

Radio base station for communication with an outside broadcasting van and a maintenance vehicle

SSB short wave engineering link radio and antenna:

Radio for communication with other stations when the telephone relay line is not available

Locker:

For accommodation of spare parts and accessories

Test tapes:

Tapes with test signals recorded to check the recorder's conditions and tapes not recorded for trial check

(10) Spare Parts

Details are to be defined at the time of detailed design, but the following basic parts shall be supplied at the minimum for the operation to be continued about two years without replenishing parts after installation and during which period the owner can grasp the spare parts consumption and take some budgetary actions.

transmitting tube	100% of quantity in use
relay & switch	1 for each type
lamp & fuse	200% of quantity in use
fan motor	100% of quantity in use
main equipment module	1 for each type
transistor & IC	2 for each type
air filter	200% of quantity in use

3-4-3 Station House Facilities

Main factors and elements of design for station house facilities are described below.

(1) Site Plan

In this Project, the necessity for the entire shield to the station house is excluded by separating the house and antenna mast. This is to minimize the site work. Accordingly, the station house will be constructed outside the radial earth which

is a strong electric field. The exact arrangement on the site will be decided taking account of relation with access roads.

The proposed sites have some limitations in space and thus an additional antenna cannot be provided, but some space should be secured for staff quarters and office houses in view of future expansion.

An entrance turn is provided in front of the entrance hall of the house and a parking lot on the power supply room side, and a 6m wide road will be constructed in the site to connect with the access road.

(2) Architectural Plan

1) Floor plan

The floor plan is determined based on the following basic concept: a simple plan in accordance with specifications of each station. Dipayal Station, however, will have a scale of a 100kW station, taking future expansion into consideration.

Various functions inside the station house are considered by dividing the house into five zones: the transmitting function zone, transmitting function auxiliary zone, studio zone, administration zone and communication passage zone. First, the transmitting function zone is extended in a line for the convenience of monitoring, maintenance and inspection. The transmitting function auxiliary zone is arranged at the back parallel to the above zone. The communication passage zone is placed in front and the administration zone and studio zone are arranged opposite to the communication passage zone.

(refer to Fig. 3-4-1)

- . Transmitting function auxiliary zone
- . Transmitting function zone
- . Communication passage zone
- . Administration zone
- . Studio zone

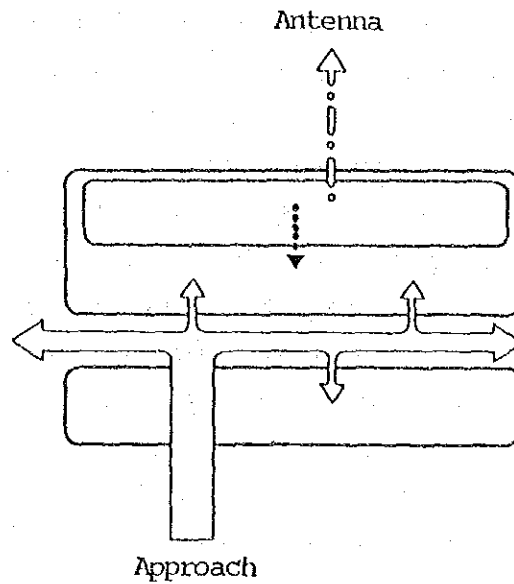


Fig. 3-4-1 Conceptual Floor Plan of Station House

The transmitting function zone and transmitting function auxiliary zone include a transmitter room for 100kW and 10kW transmitters, a console room for monitoring and control, a blower room for cooling down the transmitters, a dummy load room for the dummy load device of the transmitting antenna, a generator room for a standby generator, etc. The floor plan for these rooms was made by taking into account the functional and organic arrangement of the transmitting equipment first, and then their scale, shape and mutual locations were decided by taking into account maintenance and safety. Many pieces of transmitting equipment are charged with high voltages, thus sufficient space should be kept around the equipment. For dangerous pieces of equipment in particular, they should be put together in one place and surrounded with a fence. Moreover, sufficient space should be secured outside the

equipment to be used for inspection in the Project. Surrounding spaces required for equipment vary with the type of equipment, but it is necessary to reserve at least 60cm for maintenance and inspection, and at least 100cm for equipment having doors opening to the front.

The various pieces of equipment installed form one system as a whole, thus locations for them are important, requiring the layout to be connected organically. Moreover, the blower, dummy load and generator require air charging and exhausting, so their locational relation to the outside is important.

Taking into account the installation of a commercial power panel and an automatic voltage regulator, and to minimize space besides that used for the equipment, a minimum area is secured for the generator room.

The studio zone consists of a studio floor for performance and a sub-control room for equipment installed. The studio size is such that news or talk programmes can be broadcasted or recorded, and the sub-control room size is such that necessary equipment can be installed in an orderly manner considering their operability and maintainability.

The administration zone consists of office rooms and a night-duty room. Three types of office rooms for administration staff, engineering staff and programme production staff are prepared as required.

The three shift system is employed because transmitting hours last from 0600 hours to 2400 hours. Thus, a night duty room is necessary for two persons. A 12.6m² space has been set aside taking as a standard sick room space for one person in hospital (more than 6.3m²/person by Japanese medical law) and then doubling this. A hot water service

room is also to be installed next to the night-duty room and space for lockers is also provided. A shower room is provided in a corner of the rest room.

The communication passage zone includes a corridor, rest room, shower room, hot water service room, etc. About 20% of the total floor area is taken up for this zone through referring to general office buildings. The maximum number of persons working at any time is about eight (one manager, one clerk, three engineers and three programmers), thus one closet booth, two urinal stalls and one wash basin are provided as a minimum standard. A shower booth is also provided for the duty staff. Area standards of Japan are employed for these space sizes.

2) Section plan

The possibility of a temporary flood due to a localized torrential downpour should be taken into consideration. Thus, the floor shall be 400mm higher than the average GL. And the floor of each room shall be the same level to facilitate taking in and out the equipment.

Exceptions are the floors of the rest room and the shower room.

As for the room height, some equipment is about 2,400mm high and an additional space of about 1,500mm for ducts, piping and wiring is required above the 2,400mm height, thus a total height of 3,900mm shall be allowed for below the girders.

3) House structural plan

The base shall be a spread foundation with footing, and reinforced concrete for the base shall be cast in place.

The prefabricated system shall be employed for the main structure above GL. This system is one in which autoclaved light-weight concrete panels (ALC panels) are fixed to pin-braced construction frames with structural steel as the external wall, and in which the roof is covered with

galvanized sheet iron plates utilizing folded plate structure (double). Partition walls are of light-weight steel frames with backing boards fixed.

With some exceptions, all of the main structures are of dry construction, and plaster work requiring drying time shall be limited to the rest room and shower room.

4) Interior and exterior finishing plan

To fully realize the basic policy that the main structure is to be of prefabricated construction and to improve its merit, a dry finish system shall be employed for both interior and exterior work.

The floor shall be covered mainly with plastic tiles which make maintenance easier and minimize dust due to wear. Porcelain tiles shall only be used for places where there is running water.

The console room, office rooms, night-duty room, and water-related rooms shall be provided with ceilings so as to limit room capacity and to secure comfortable living, but other rooms are not provided with ceilings.

Paint shall be applied to both interior and exterior surfaces as a final finishing material. Paints made in Japan which are stable in quality shall be used taking durability into consideration.

(3) Equipment Plan

Equipment systems suitable for the climatic conditions on the sites and which are easy to maintain and control as well as the least expensive to operate shall be employed. In addition, the systems should be of high durability and maintainability, as well as easily replenished with expendable and spare parts.

1) Electric equipment

The main electric power, 3-phase 4-line 400V/230V, shall be obtained from a distribution board in the generator room and supplied to three channels of power, lighting fixtures and receptacle outputs.

Fluorescent lamps, which are economical for lighting, shall be mainly used, and the intensity of illumination shall be 400 luxes for the office rooms and console room, 300 luxes for the transmitter room and 100 luxes for the other rooms.

2) Plumbing equipment

His Majesty's Government of Nepal is responsible for laying a water supply pipe up to the boundary line of the site. Piping shall be led in from this point, and water shall first be put into a 2m³ tank with a fixed gauge, and then distributed to each faucet with automatic water supply units. Water supply points shall be the hot water service room, rest room, shower room and outside sprinklers.

General drain and waste water should be divided into different systems in drainage, and they are to be accumulated at a drainage basin outside the house. A sewage system cannot be expected in the future, thus on the assumption that there will be on-site disposal, a septic tank and an infiltration tank shall be installed at an appropriate spot on the site.

3) Ventilating equipment

Sufficient ventilation is required for the transmitter room, generator room, dummy load room, etc., which are heated by their equipment. Hence, the necessary number of propeller fans shall be installed on the outside walls.

Air is supplied from air supply louvers fitted on the outside walls and air chambers shall be provided to prevent dust, sand, withered leaves, insects, etc. from coming

in. Forced ventilation shall be provided for the 100kW transmitter by installing a blower in particular.

Ventilation in the console room shall be provided by installing a ventilating louver and fan between the room and the transmitter room. A forced ventilation system shall also be provided for the rest room, shower room and hot water service room.

4) Air conditioning equipment

Temperatures reach around 10°C in winter and 30°C in summer. Accordingly, the rooms where official duties are continuously conducted such as the console room, office rooms, duty room and studio room shall be provided with air conditioning.

The transmitter room is so designed as to function correctly at temperatures below 40°C, thus a specific blower for the transmitter shall be provided so as to restrict the rise of temperatures in the room or in the transmitter itself by heat generation. A large size propeller fan shall also be provided to vent the room air to the outside. Forced ventilation shall be provided for the dummy load room and generator room only when they are in use to prevent a rise in room temperatures.

3-4-4 Principal Equipment for each Station

Principal equipment for Surkhet Broadcasting Station, Dhankuta Studio, Dhankuta Transmitting Station, Dipayal Broadcasting Station and Dhalkebar Transmitting Station is shown in the Table 3-4-1.

Table 3-4-1 Principal Equipment for Each Station

(Surkhet Broadcasting Station 1/5)

Item	Description	Quantity
Surkhet Broadcasting Station		
1) Transmitter	100kW AM Radio Transmitter	1 set
	10kW AM Radio Transmitter	1 set
	100kW/10kW HF Exchanger Switch	1 set
	100kW/10kW Air-cooled Dummy Load	1 set
	High-speed Surge Protector	2 sets
	Programme Input Equipment	1 set
	Monitoring Equipment	1 set
	Control/Monitoring Console	1 set
	Rack Assembly	2 sets
	Loudspeaker for Monitor	1 set
2) Antenna System	Cylindrical Steel Mast (120m)	1 set
	Obstruction Lighting Equipment	1 set
	Radial Earth	1 set
	6-wire Aerial Feeder Line	1 set
	Antenna Tuning Unit with Hut	1 set

(Surkhet Broadcasting Station 2/5)

Item	Description	Quantity
3) Programme Transmission Line	Telephone Line Terminal	1 set
	All Wave Receiver	2 sets
	Input Selection Switcher	1 set
	Rack Assembly	1 set
	Receiving Antenna with Feeder	1 set
	Mast (20m)	2 sets
4) Power supply	Step-down Transformer (500kVA)	1 set
	Incoming Panel	1 set
	Feeder Panel	1 set
	Distribution Panel	1 set
	Automatic Voltage Regulator (400kVA) & Control Panel	1 set
	Engine Generator (100kVA)	1 set
	Dummy Load for the above	1 set
	Generator Control Panel	1 set
	Main Fuel Oil Tank (3000 ℓ)	1 set
	Sub Fuel Oil Tank (390 ℓ)	1 set
Battery & Charger	1 set	

(Surkhet Broadcasting Station 3/5)

Item	Description	Quantity
5) Studio	8-channel Audio Mixing Console	1 set
	Open Reel Tape Recorder	2 sets
	Cartridge Tape Recorder	2 sets
	Cassette Tape Recorder	2 sets
	Disc Player	1 set
	Microphone & Cable	1 lot
	Microphone Stand	1 lot
	Announcer Cough Box	1 set
	Announcer Desk	1 set
	Loudspeaker for Monitor	2 sets
6) Outside Broadcasting Van	Portable Audio Mixer (4 channels)	1 set
	Portable Tape Recorder	2 sets
	Loudspeaker for Monitor	2 sets
	Microphone & Cable	1 lot
	Microphone Stand	1 lot
	VHF Transceiver with Antenna	1 set
	Portable Engine Generator (500W)	2 sets
	Vehicle	1 set

(Surkhet Broadcasting Station 4/5)

Item	Description	Quantity
7) Measuring Equipment	Audio Test Set	2 sets
	Variable Attenuator	2 sets
	Frequency Counter	1 set
	AM Modulation Monitor	1 set
	Oscilloscope with Cart	2 sets
	Circuit Tester	3 sets
	RF Bridge/Oscillator	1 set
	Field Strength Meter	1 set
	Electric Voltmeter	2 sets
	Megger	1 set
	Ammeter	1 set
	Voltmeter	1 set
	Earthmeter	1 set
8) Maintenance Tool & Vehicle	Tools for Broadcasting Equipment	4 sets
	Tools for Engine Generator	1 set
	VHF Transceiver with Antenna	1 set
	Vehicle	1 set
9) Ancillaries & Others	Room to Room Intercom	1 set
	Clock	7 sets
	VHF Transceiver with Antenna	1 set
	SSB Short-wave Transceiver with Antenna	1 set
	Locker	3 sets
	Test Tape	1 lot

(Surkhet Broadcasting Station 5/5)

Item	Description	Quantity
10) Spare Parts	Spare Parts for Broadcasting Equipment	1 lot
	Spare Parts for Engine Generator	1 lot
11) Station House	Station House (432m ²)	1 set
	Electric Equipment	1 set
	Plumbing Equipment	1 set
	Ventilating Equipment	1 set
	Air Conditioning Equipment	1 set

(Dhankuta Studio 1/4)

Item	Description	Quantity
Dhankuta Broadcasting Station		
(Dhankuta Studio)		
1) Studio	8-channel Audio Mixing Console Open Reel Tape Recorder Cartridge Tape Recorder Cassette Tape Recorder Disc Player Microphone & Cable Microphone Stand Announcer Cough Box Announcer Desk Loudspeaker for Monitor	1 set 2 sets 2 sets 2 sets 1 set 1 lot 1 lot 1 set 1 set 2 sets
2) Programme Transmission Line	Telephone Line Terminal All Wave Receiver Input Selection Switcher Rack Assembly Receiving Antenna with Feeder Mast (20m)	1 set 2 sets 1 set 1 set 1 set 2 sets

Item	Description	Quantity
3) Power supply	Step-down Transformer (30kVA)	1 set
	Incoming Panel	1 set
	Feeder Panel	1 set
	Distribution Panel	1 set
	Automatic Voltage Regulator (20kVA) & Control Panel	1 set
	Engine Generator (20kVA)	1 set
	Dummy Load for the above	1 set
	Generator Control Panel	1 set
	Main Fuel Oil Tank (1000 ℓ)	1 set
	Sub Fuel Oil Tank (200 ℓ)	1 set
	Battery & Charger	1 set
4) Outside Broadcasting Van	Portable Audio Mixer (4 channels)	1 set
	Portable Tape Recorder	2 sets
	Loudspeaker for Monitor	2 sets
	Microphone & Cable	1 lot
	Microphone Stand	1 lot
	VHF Transceiver with Antenna	1 set
	Portable Engine Generator (500W)	2 sets
	Vehicle	1 set

(Dhankuta Studio 3/4)

Item	Description	Quantity
5) Measuring Equipment	Audio Test Set	1 set
	Variable Attenuator	1 set
	Oscilloscope with Cart	1 set
	Circuit Tester	2 sets
	Electric Voltmeter	1 set
	Megger	1 set
	Ammeter	1 set
	Voltmeter	1 set
	Earthmeter	1 set
6) Maintenance Tool & Vehicle	Tools for Broadcasting Equipment	2 sets
	Tools for Engine Generator	1 set
	VHF Transceiver with Antenna	1 set
	Vehicle	1 set
7) Ancillaries & Others	Room to Room Intercom	1 set
	Clock	4 sets
	VHF Transceiver with Antenna	1 set
	SSB Short-wave Transceiver with Antenna	1 set
	Locker	1 set
	Test Tape	1 lot

(Dhankuta Studio 4/4)

Item	Description	Quantity
8) Spare Parts	Spare Parts for Broadcasting Equipment	1 lot
	Spare Parts for Engine Generator	1 lot
9) Station House	Station House (162m ²)	1 set
	Electric Equipment	1 set
	Plumbing Equipment	1 set
	Ventilating Equipment	1 set
	Air Conditioning Equipment	1 set

(Dhankuta Transmitting Station 1/4)

Item	Description	Quantity
Dhankuta Transmitting Station		
1) Transmitter	100kW AM Radio Transmitter	1 set
	10kW AM Radio Transmitter	1 set
	100kW/10kW HF Exchanger Switch	1 set
	100kW/10kW Air-cooled Dummy Load	1 set
	High-speed Surge Protector	2 sets
	Programme Input Equipment	1 set
	Monitoring Equipment	1 set
	Control/Monitoring Console	1 set
	Rack Assembly	2 sets
	Loudspeaker for Monitor	1 set
2) Antenna System	Cylindrical Steel Mast (120m)	1 set
	Obstruction Lighting Equipment	1 set
	Radial Earth	1 set
	6-wire Aerial Feeder Line	1 set
	Antenna Tuning Unit with Hut	1 set

(Dhankuta Transmitting Station 2/4)

Item	Description	Quantity
3) Programme Transmission Line	Telephone Line Terminal	1 set
	All Wave Receiver	2 sets
	Input Selection Switcher	1 set
	Rack Assembly	1 set
	Receiving Antenna with Feeder	1 set
	Mast (20m)	2 sets
4) Power supply	Step-down Transformer (500kVA)	1 set
	Incoming Panel	1 set
	Feeder Panel	1 set
	Distribution Panel	1 set
	Automatic Voltage Regulator (400kVA) & Control Panel	1 set
	Engine Generator (100kVA)	1 set
	Dummy Load for the above	1 set
	Generator Control Panel	1 set
	Main Fuel Oil Tank (3000 ℓ)	1 set
Sub Fuel Oil Tank (390 ℓ)	1 set	
Battery & Charger	1 set	

(Dhankuta Transmitting Station 3/4)

Item	Description	Quantity
5) Measuring Equipment	Audio Test Set	1 set
	Variable Attenuator	1 set
	Frequency Counter	1 set
	AM Modulation Monitor	1 set
	Oscilloscope with Cart	1 set
	Circuit Tester	2sets
	RF Bridge/Oscillator	1 set
	Field Strength Meter	1 set
	Electric Voltmeter	1 set
	Megger	1 set
	Ammeter	1 set
	Voltmeter	1 set
	Earthmeter	1 set
6) Maintenance Tool & Vehicle	Tools for Broadcasting Equipment	2 sets
	Tools for Engine Generator	1 set
	VHF Transceiver with Antenna	1 set
	Vehicle	1 set
7) Ancillaries & Others	Room to Room Intercom	1 set
	Clock	4 sets
	VHF Transceiver with Antenna	1 set
	SSB Short-wave Transceiver with Antenna	1 set
	Locker	2 sets

(Dhankuta Transmitting Station 4/4)

Item	Description	Quantity
8) Spare Parts	Spare Parts for Broadcasting Equipment	1 lot
	Spare Parts for Engine Generator	1 lot
9) Station House	Station House (360m ²)	1 set
	Electric Equipment	1 set
	Plumbing Equipment	1 set
	Ventilating Equipment	1 set
	Air Conditioning Equipment	1 set

(Dipayal Broadcasting Station 1/4)

Item	Description	Quantity
Dipayal Broadcasting Station		
1) Transmitter	10kW AM Radio Transmitter	2 sets
	10kW HF Exchanger Switch	1 set
	10kW Air-cooled Dummy Load	1 set
	High-speed Surge Protector	2 sets
	Programme Input Equipment	1 set
	Monitoring Equipment	1 set
	Control/Monitoring Console	1 set
	Rack Assembly	2 sets
	Loudspeaker for Monitor	1 set
2) Antenna System	Cylindrical Steel Mast (60m)	1 set
	Obstruction Lighting Equipment	1 set
	Radial Earth	1 set
	6-wire Aerial Feeder Line	1 set
	Antenna Tuning Unit with Hut	1 set
3) Programme Transmission Line	Telephone Line Terminal	1 set
	All Wave Receiver	2 sets
	Input Selection Switcher	1 set
	Rack Assembly	1 set
	Receiving Antenna with Feeder	1 set
	Mast (20m)	2 sets

(Dipayal Broadcasting Station 2/4)

Item	Description	Quantity
4) Power supply	Step-down Transformer (150kVA)	1 set
	Incoming Panel	1 set
	Feeder Panel	1 set
	Distribution Panel	1 set
	Automatic Voltage Regulator (100kVA) & Control Panel	1 set
	Engine Generator (100kVA)	1 set
	Dummy Load for the above	1 set
	Generator Control Panel	1 set
	Main Fuel Oil Tank (3000 l)	1 set
	Sub Fuel Oil Tank (390 l)	1 set
	Battery & Charger	1 set
5) Studio	8-channel Audio Mixing Console	1 set
	Open Reel Tape Recorder	2 sets
	Cartridge Tape Recorder	2 sets
	Cassette Tape Recorder	2 sets
	Disc Player	1 set
	Microphone & Cable	1 lot
	Microphone Stand	1 lot
	Announcer Cough Box	1 set
	Announcer Desk	1 set
	Loudspeaker for Monitor	2 sets

(Dipayal Broadcasting Station 3/4)

Item	Description	Quantity
6) Outside Broadcasting Van	Portable Audio Mixer (4 channels)	1 set
	Portable Tape Recorder	2 sets
	Loudspeaker for Monitor	2 sets
	Microphone & Cable	1 lot
	Microphone Stand	1 lot
	VHF Transceiver with Antenna	1 set
	Portable Engine Generator (500W)	2 sets
	Vehicle	1 set
7) Measuring Equipment	Audio Test Set	2 sets
	Variable Attenuator	2 sets
	Frequency Counter	1 set
	AM Modulation Monitor	1 set
	Oscilloscope with Cart	2 sets
	Circuit Tester	3 sets
	RF Bridge/Oscillator	1 set
	Field Strength Meter	1 set
	Electric Voltmeter	2 sets
	Megger	1 set
	Ammeter	1 set
	Voltmeter	1 set
Earthmeter	1 set	

(Dipayal Broadcasting Station 4/4)

Item	Description	Quantity
8) Maintenance Tool & Vehicle	Tools for Broadcasting Equipment	4 sets
	Tools for Engine Generator	1 set
	VHF Transceiver with Antenna	1 set
	Vehicle	1 set
9) Ancillaries & Others	Room to Room Intercom	1 set
	Clock	7 sets
	VHF Transceiver with Antenna	1 set
	SSB Short-wave Transceiver with Antenna	1 set
	Locker	3 sets
	Test Tape	1 lot
10) Spare Parts	Spare Parts for Broadcasting Equipment	1 lot
	Spare Parts for Engine Generator	1 lot
11) Station House	Station House (432m ²)	1 set
	Electric Equipment	1 set
	Plumbing Equipment	1 set
	Ventilating Equipment	1 set
	Air Conditioning Equipment	1 set

(Dhalkebar Transmitting Station 1/4)

Item	Description	Quantity
Dhalkebar Transmitting Station		
1) Transmitter	10kW AM Radio Transmitter	2 sets
	10kW HF Exchanger Switch	1 set
	10kW Air-cooled Dummy Load	1 set
	High-speed Surge Protector	2 sets
	Programme Input Equipment	1 set
	Monitoring Equipment	1 set
	Control/Monitoring Console	1 set
	Rack Assembly	2 sets
	Loudspeaker for Monitor	1 set
2) Antenna System	Cylindrical Steel Mast (60m)	1 set
	Obstruction Lighting Equipment	1 set
	Radial Earth	1 set
	6-wire Aerial Feeder Line	1 set
	Antenna Tuning Unit with Hut	1 set

(Dhalkebar Transmitting Station 2/4)

Item	Description	Quantity
3) Programme Transmission Line	Telephone Line Terminal VHF Transmitter & Receiver with Antenna & Feeder All Wave Receiver Input Selection Switcher Rack Assembly Receiving Antenna with Feeder Mast (20m)	1 set 1 set 2 sets 1 set 1 set 1 set 2 sets
4) Power supply	Step-down Transformer (150kVA) Incoming Panel Feeder Panel Distribution Panel Automatic Voltage Regulator (100kVA) & Control Panel Engine Generator (100kVA) Dummy Load for the above Generator Control Panel Main Fuel Oil Tank (3000 l) Sub Fuel Oil Tank (390 l) Battery & Charger	1 set 1 set 1 set 1 set 1 set 1 set 1 set 1 set 1 set 1 set 1 set

(Dhalkebar Transmitting Station 3/4)

Item	Description	Quantity
5) Measuring Equipment	Audio Test Set	1 set
	Variable Attenuator	1 set
	Frequency Counter	1 set
	AM Modulation Monitor	1 set
	Oscilloscope with Cart	1 set
	Circuit Tester	2 sets
	RF Bridge/Oscillator	1 set
	Field Strength Meter	1 set
	Electric Voltmeter	1 set
	Megger	1 set
	Ammeter	1 set
	Voltmeter	1 set
	Earthmeter	1 set
	FM Standard Signal Generator	1 set
	Spectrum Analyzer	1 set
	Variable Attenuator (VHF)	1 set
	Portable Power Meter	1 set
Directional Coupler	1 set	
FM Linear Detector	1 set	
6) Maintenance Tool & Vehicle	Tools for Broadcasting Equipment	2 sets
	Tools for Engine Generator	1 set
	VHF Transceiver with Antenna	1 set
	Vehicle	1 set

(Dhalkebar Transmitting Station 4/4)

Item	Description	Quantity
7) Ancillaries & Others	Room to Room Intercom	1 set
	Clock	4 sets
	VHF Transceiver with Antenna	1 set
	SSB Short-wave Transceiver with Antenna	1 set
	Locker	2 sets
8) Spare Parts	Spare Parts for Broadcasting Equipment	1 lot
	Spare Parts for Engine Generator	1 lot
9) Station House	Station House (288m ²)	1 set
	Electric Equipment	1 set
	Plumbing Equipment	1 set
	Ventilating Equipment	1 set
	Air Conditioning Equipment	1 set

3-4-5 Basic Design Drawings

- Fig. 3-4-2 Surkhet Broadcasting Station; System Diagram
- Fig. 3-4-3 Dhankuta Studio; System Diagram
- Fig. 3-4-4 Dhankuta Transmitting Station; System Diagram
- Fig. 3-4-5 Dipayal Broadcasting Station; System Diagram
- Fig. 3-4-6 Dhalkebar Transmitting Station; System Diagram
- Fig. 3-4-7 Surkhet Broadcasting Station; Outline of Transmitting Antenna
- Fig. 3-4-8 Dhankuta Transmitting Station; Outline of Transmitting Antenna
- Fig. 3-4-9 Dipayal Broadcasting Station; Outline of Transmitting Antenna
- Fig. 3-4-10 Dhalkebar Transmitting Station; Outline of Transmitting Station
- Fig. 3-4-11 Surkhet Broadcasting Station; Site Plan
- Fig. 3-4-12 Surkhet Broadcasting Station; Floor Plan of Station House 1/100
- Fig. 3-4-13 Surkhet Broadcasting Station; Elevation of Station House 1/100
- Fig. 3-4-14 Surkhet Broadcasting Station; Section of Station House 1/100
- Fig. 3-4-15 Dhankuta Studio; Site Plan
- Fig. 3-4-16 Dhankuta Studio; Floor Plan of Station House 1/100
- Fig. 3-4-17 Dhankuta Studio; Elevation of Station House 1/100
- Fig. 3-4-18 Dhankuta Studio; Section of Station House 1/100

- Fig. 3-4-19 Dhankuta Transmitting Station; Site Plan
- Fig. 3-4-20 Dhankuta Transmitting Station; Floor Plan of Station House 1/100
- Fig. 3-4-21 Dhankuta Transmitting Station; Elevation of Station House 1/100
- Fig. 3-4-22 Dhankuta Transmitting Station; Section of Station House 1/100
- Fig. 3-4-23 Dipayal Broadcasting Station; Site Plan
- Fig. 3-4-24 Dipayal Broadcasting Station; Floor Plan of Station House 1/100
- Fig. 3-4-25 Dipayal Broadcasting Station; Elevation of Station House 1/100
- Fig. 3-4-26 Dipayal Broadcasting Station; Section of Station House 1/100
- Fig. 3-4-27 Dhalkebar Transmitting Station; Site Plan
- Fig. 3-4-28 Dhalkebar Transmitting Station; Floor Plan of Station House 1/100
- Fig. 3-4-29 Dhalkebar Transmitting Station; Elevation of Station House 1/100
- Fig. 3-4-30 Dhalkebar Transmitting Station; Section of Station House 1/100

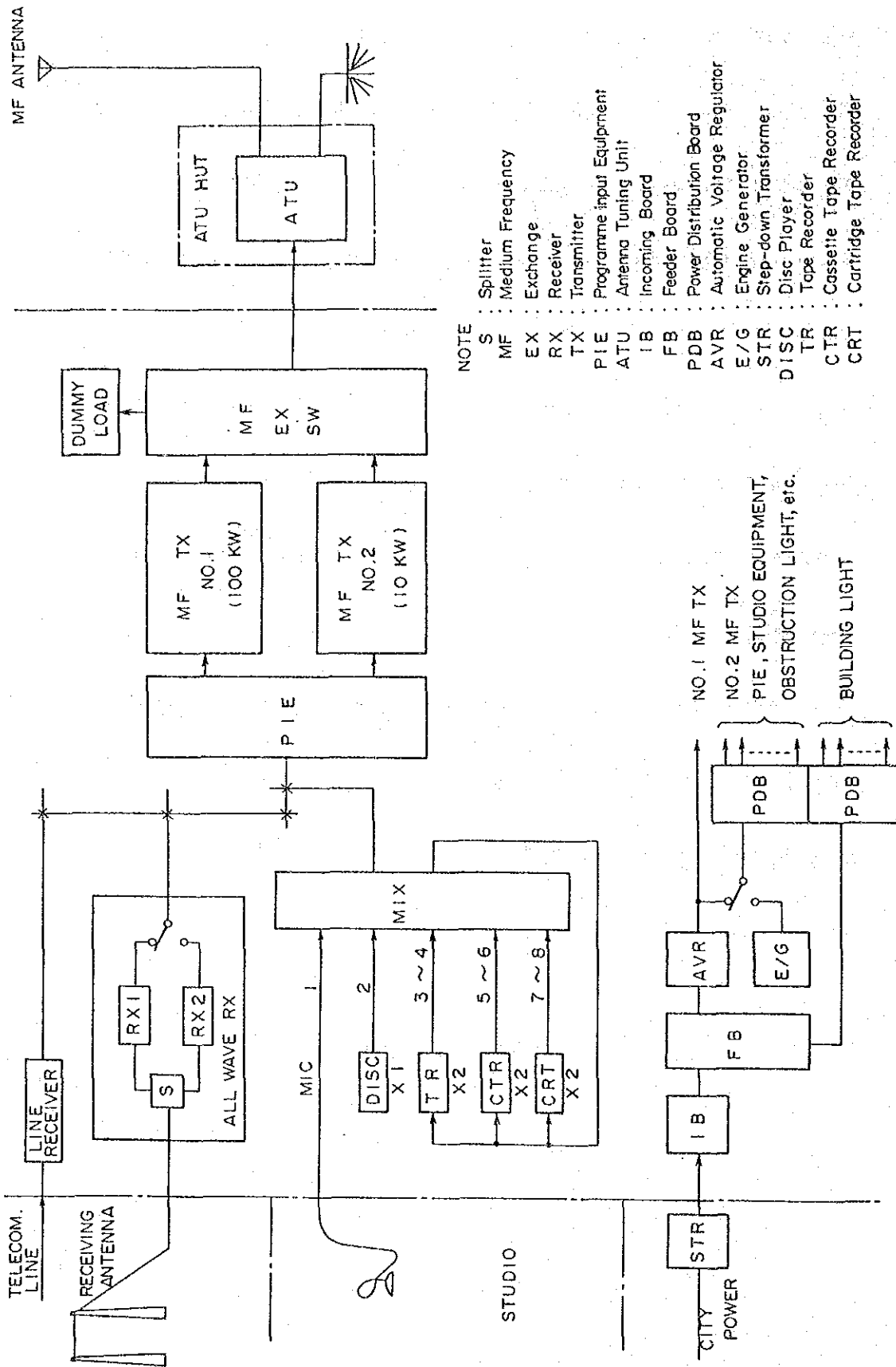
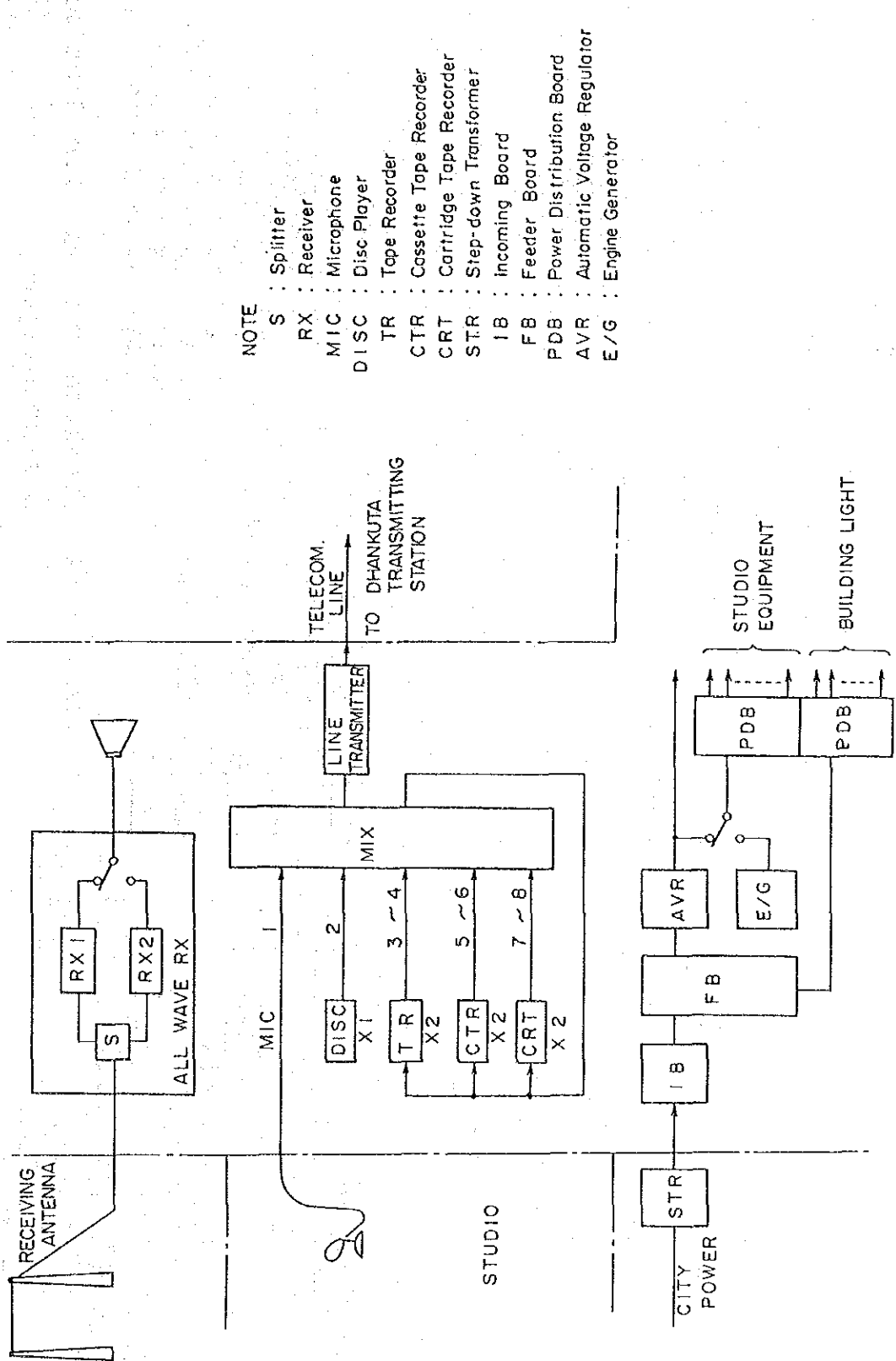


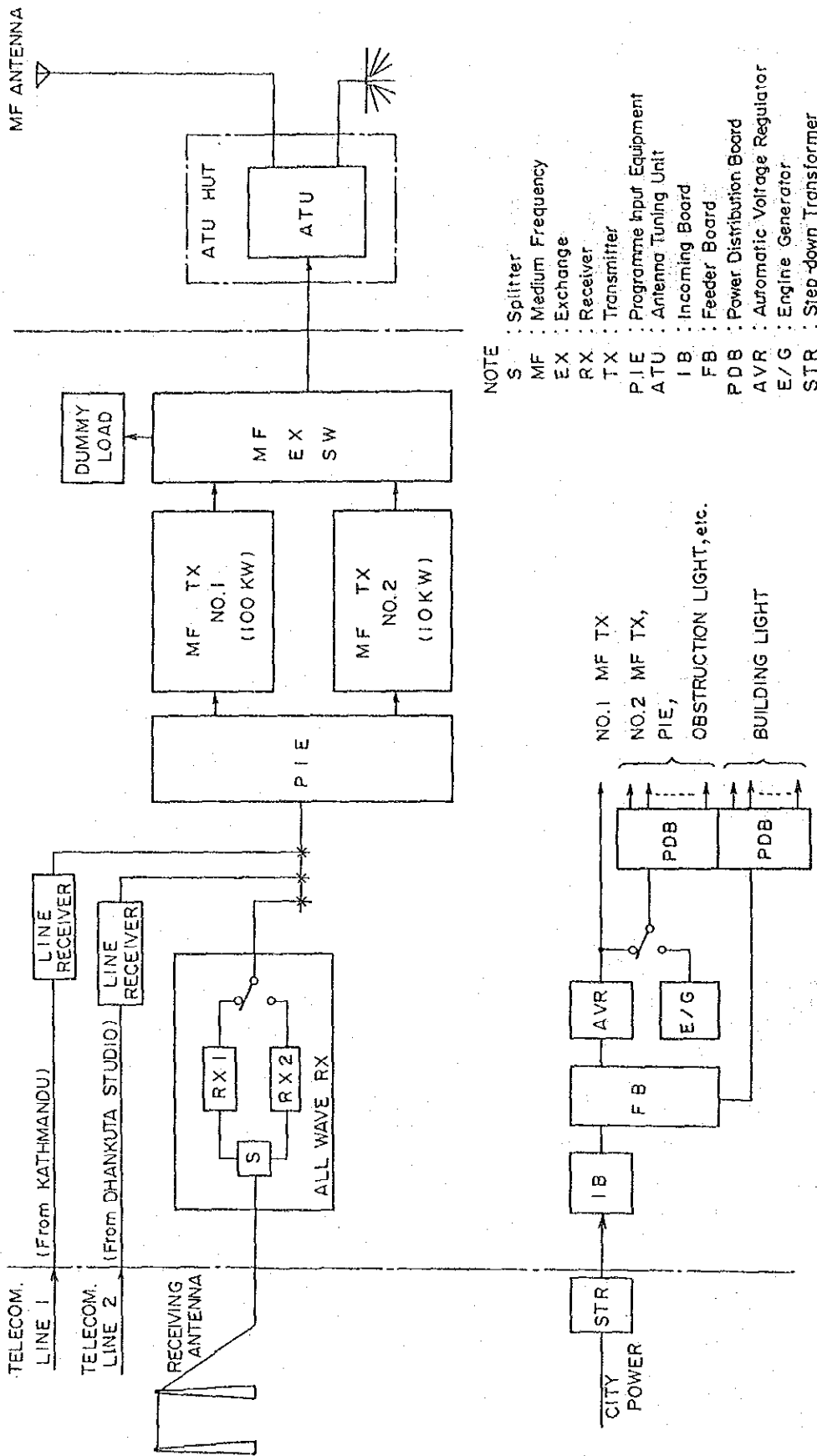
Fig. 3-4-2 Surkhet Broadcasting Station; System Diagram



NOTE

- S : Splitter
- RX : Receiver
- MIC : Microphone
- DISC : Disc Player
- TR : Tape Recorder
- CTR : Cassette Tape Recorder
- CRT : Cartridge Tape Recorder
- STR : Step-down Transformer
- IB : Incoming Board
- FB : Feeder Board
- PDB : Power Distribution Board
- AVR : Automatic Voltage Regulator
- E/G : Engine Generator

Fig. 3-4-3 Dhankuta Studio; System Diagram



NOTE

- S : Splitter
- MF : Medium Frequency
- EX : Exchange
- RX : Receiver
- TX : Transmitter
- P.I.E : Programme Input Equipment
- ATU : Antenna Tuning Unit
- IB : Incoming Board
- FB : Feeder Board
- PDB : Power Distribution Board
- AVR : Automatic Voltage Regulator
- E/G : Engine Generator
- STR : Step-down Transformer

Fig. 3-4-4 Dhankuta Transmitting Station; System Diagram

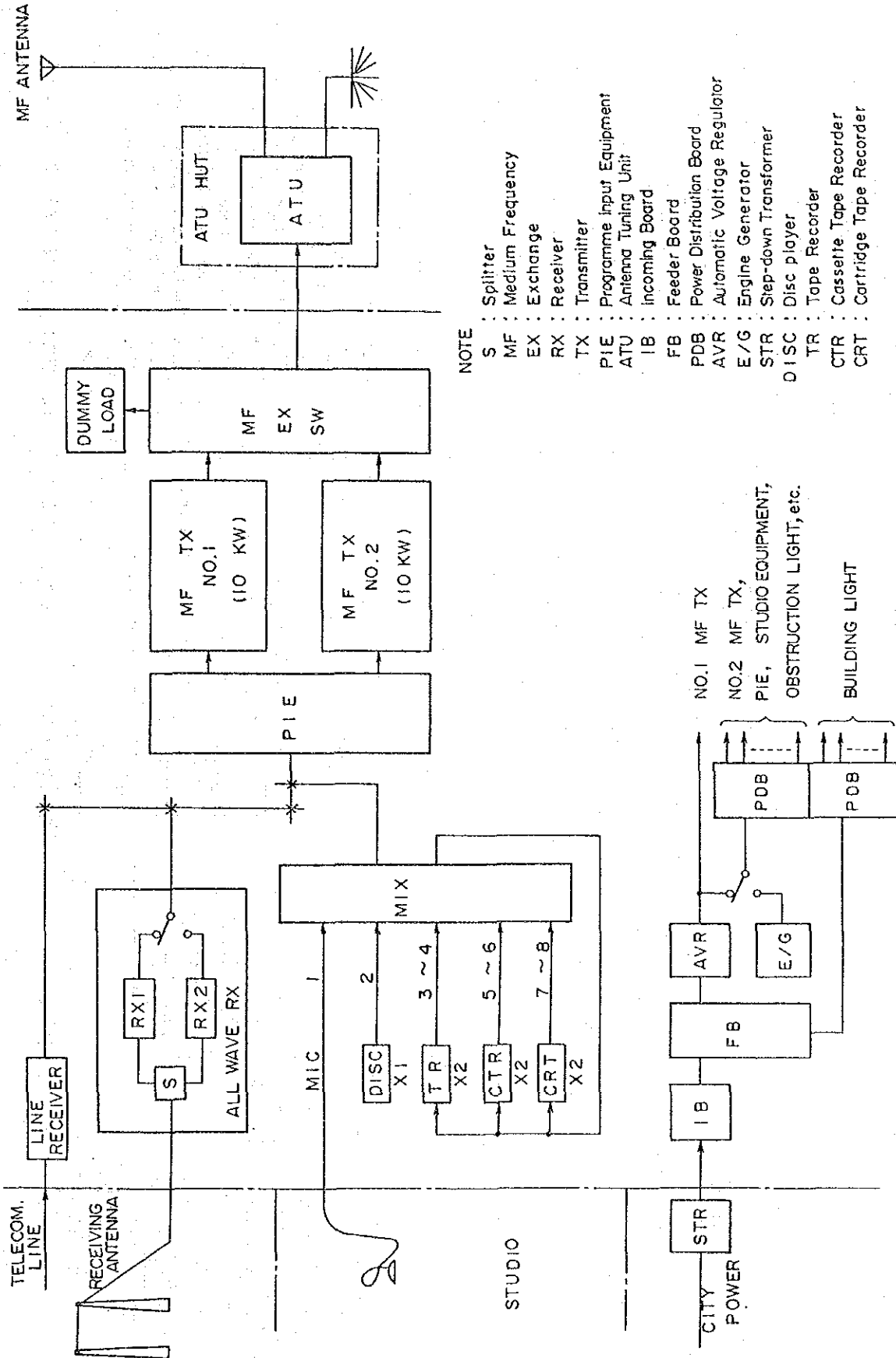
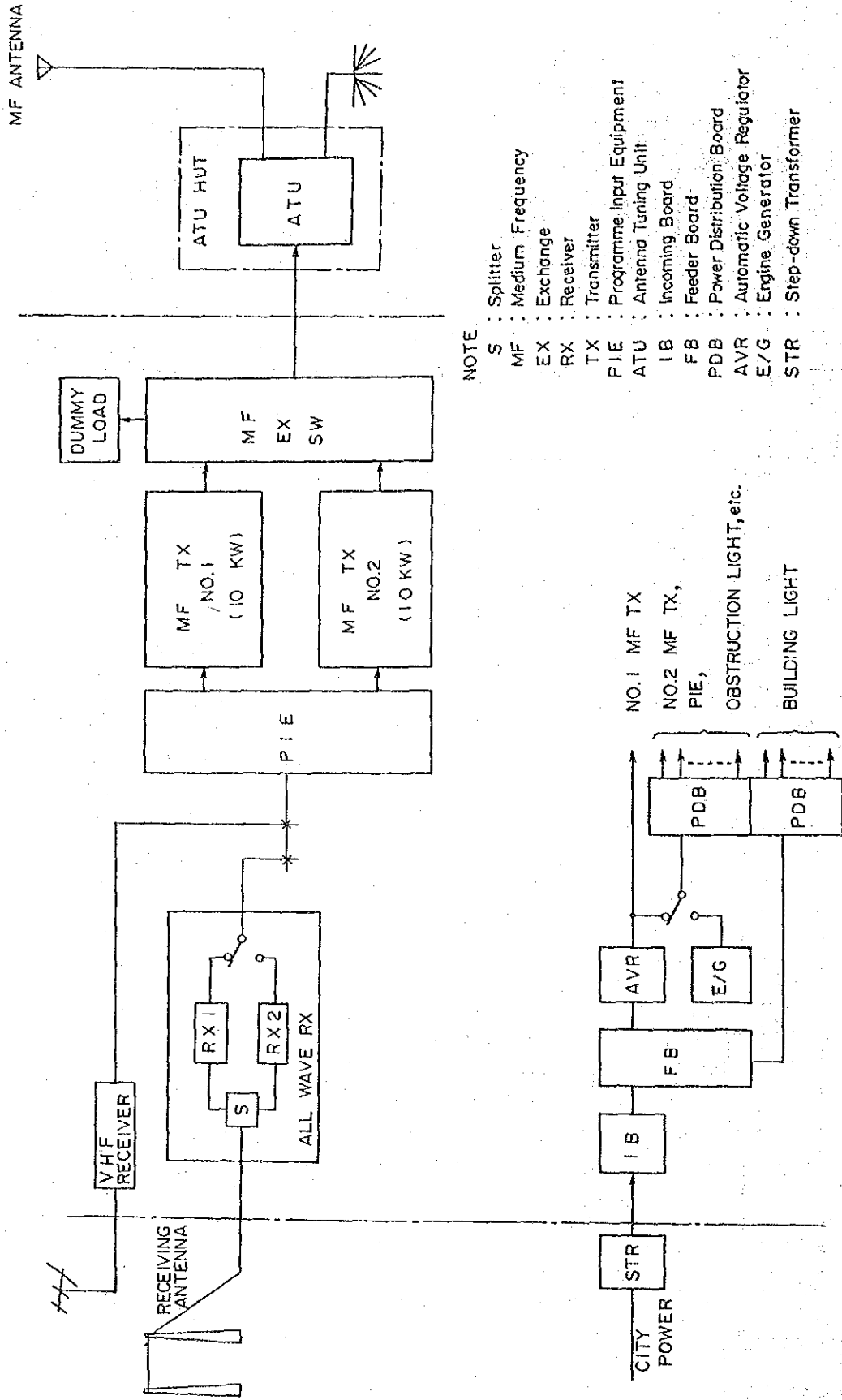


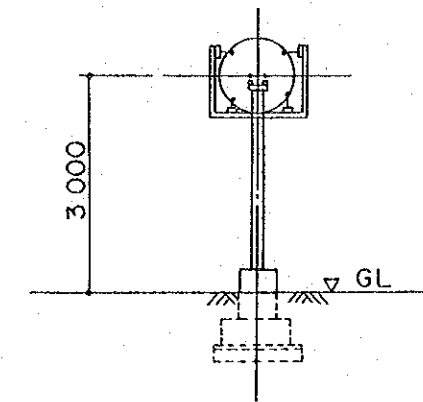
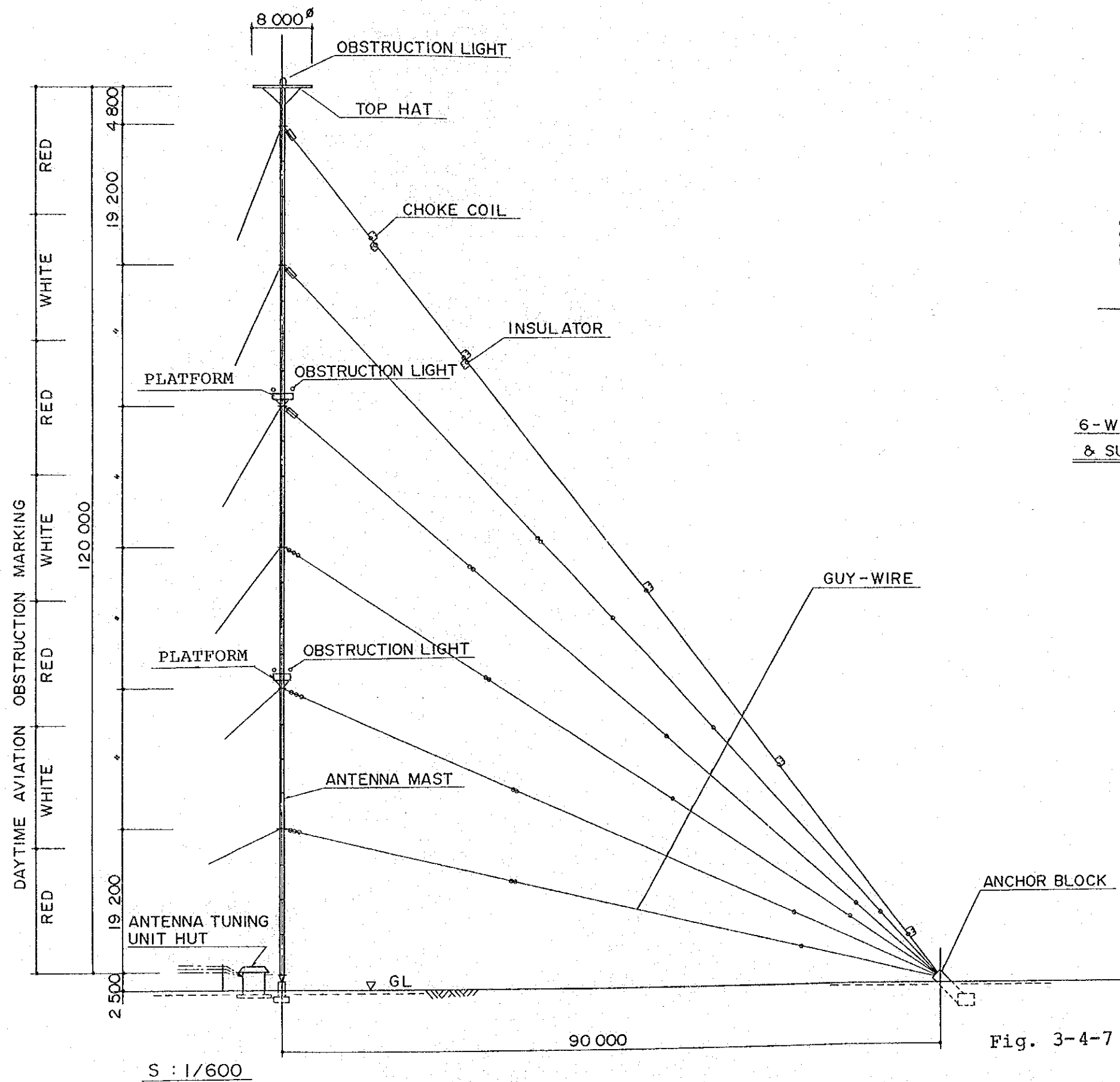
Fig. 3-4-5 Dipayal Broadcasting Station; System Diagram



NOTE

- S : Splitter
- M F : Medium Frequency
- EX : Exchange
- RX : Receiver
- TX : Transmitter
- P I E : Programme Input Equipment
- ATU : Antenna Tuning Unit
- I B : Incoming Board
- F B : Feeder Board
- PDB : Power Distribution Board
- AVR : Automatic Voltage Regulator
- E/G : Engine Generator
- STR : Step-down Transformer

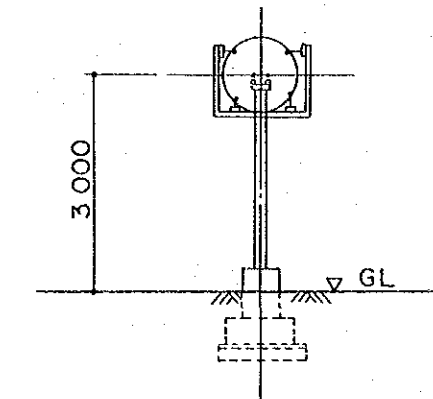
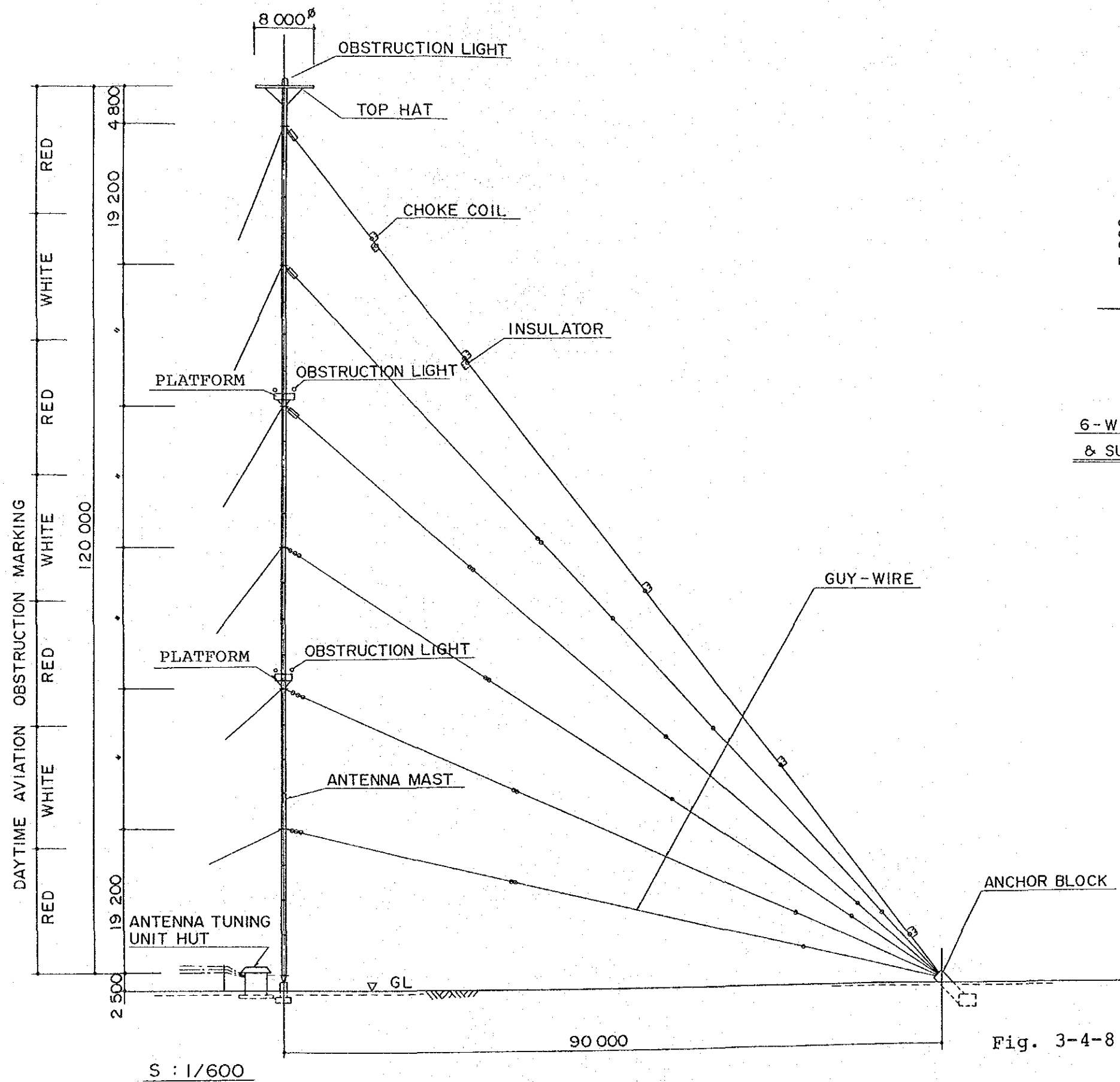
Fig. 3-4-6 Dhalkebar Transmitting Station; System Diagram



6-WIRE AERIAL FEEDER
& SUPPORTING MAST (@ 10.000)

S : 1/100

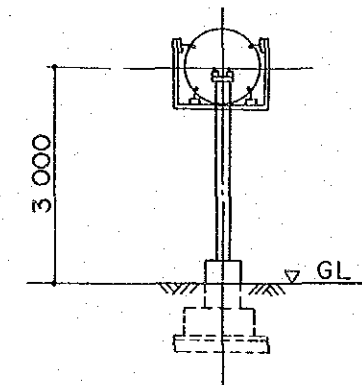
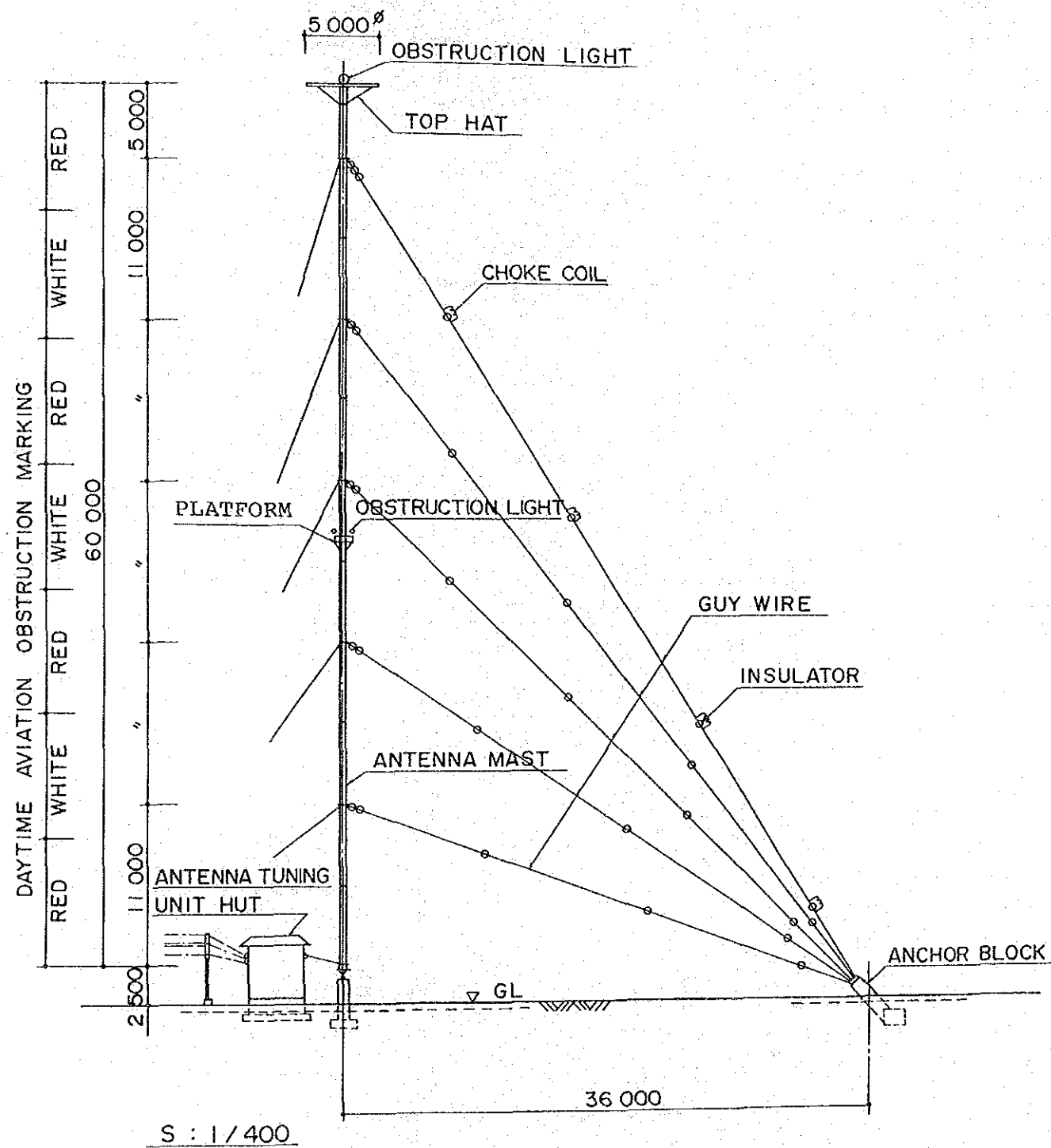
Fig. 3-4-7 Surkhet Broadcasting Station;
 Outline of Transmitting Antenna



6-WIRE AERIAL FEEDER
& SUPPORTING MAST (@ 10 000)

S : 1/100

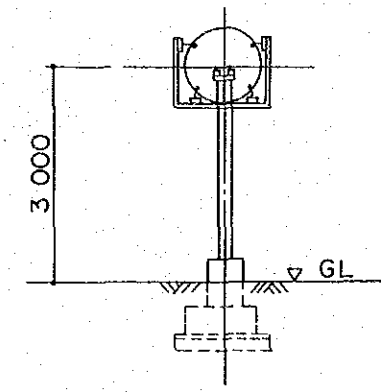
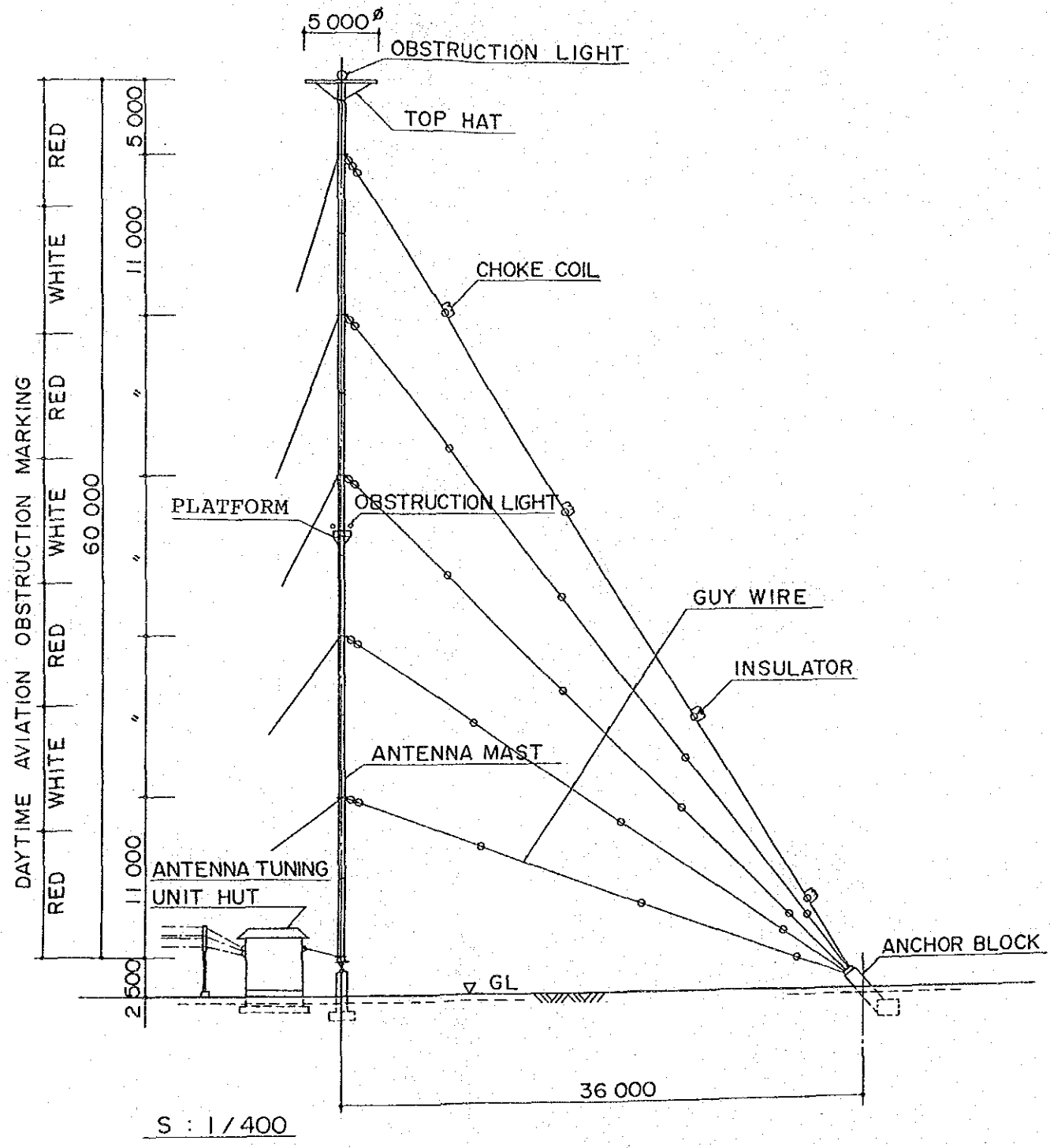
Fig. 3-4-8 Dhankuta Transmitting Station;
Outline of Transmitting Antenna



6-WIRE AERIAL FEEDER
& SUPPORTING MAST (@ 10 000)

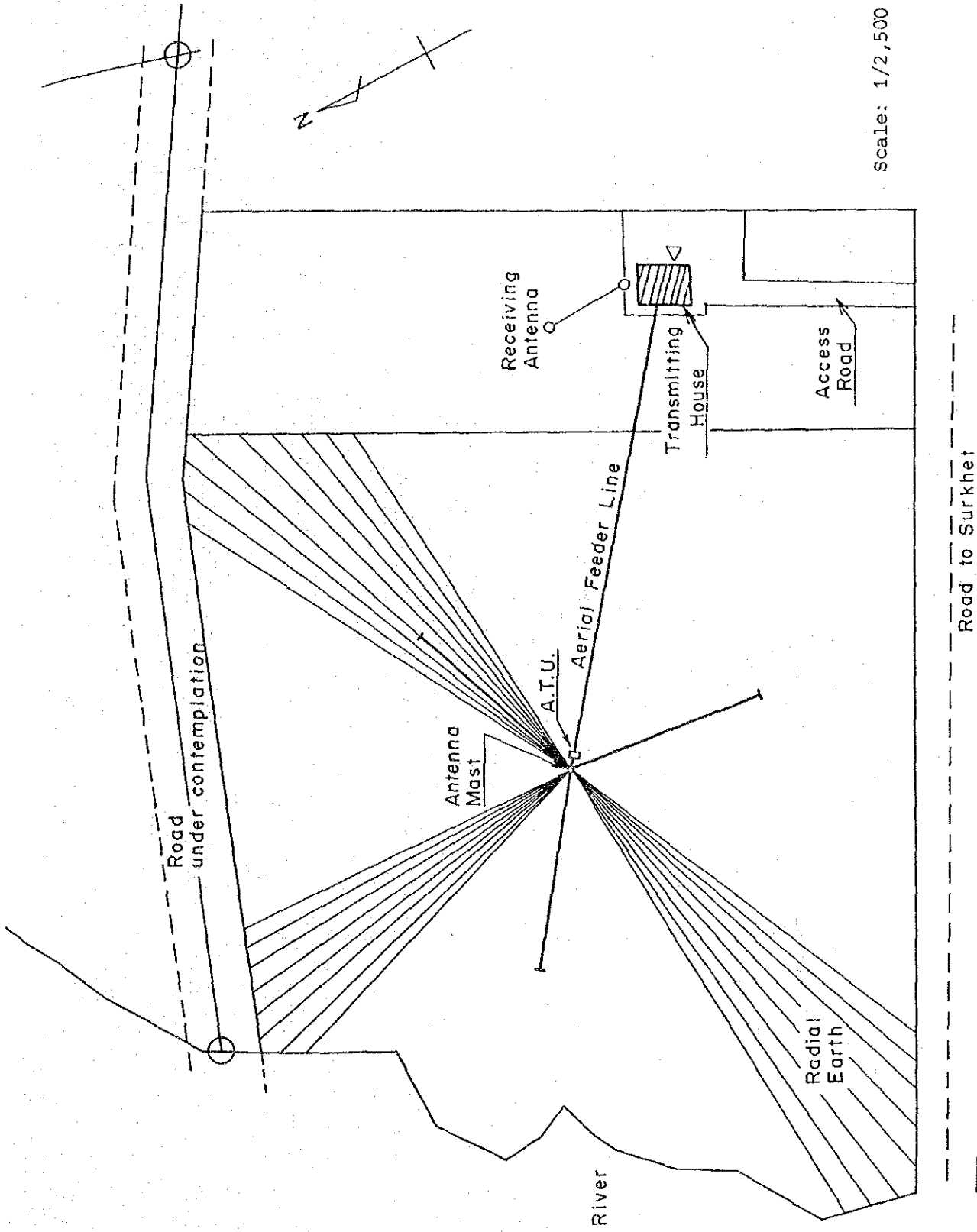
S : 1/100

Fig. 3-4-9 Dipayal Broadcasting Station;
Outline of Transmitting Antenna



6-WIRE AERIAL FEEDER
& SUPPORTING MAST (@ 10 000)
S : 1/100

Fig. 3-4-10 Dhalkebar Transmitting Station;
Outline of Transmitting Station



Scale: 1/2,500

Fig. 3-4-11 Surkhet Broadcasting Station; Site Plan

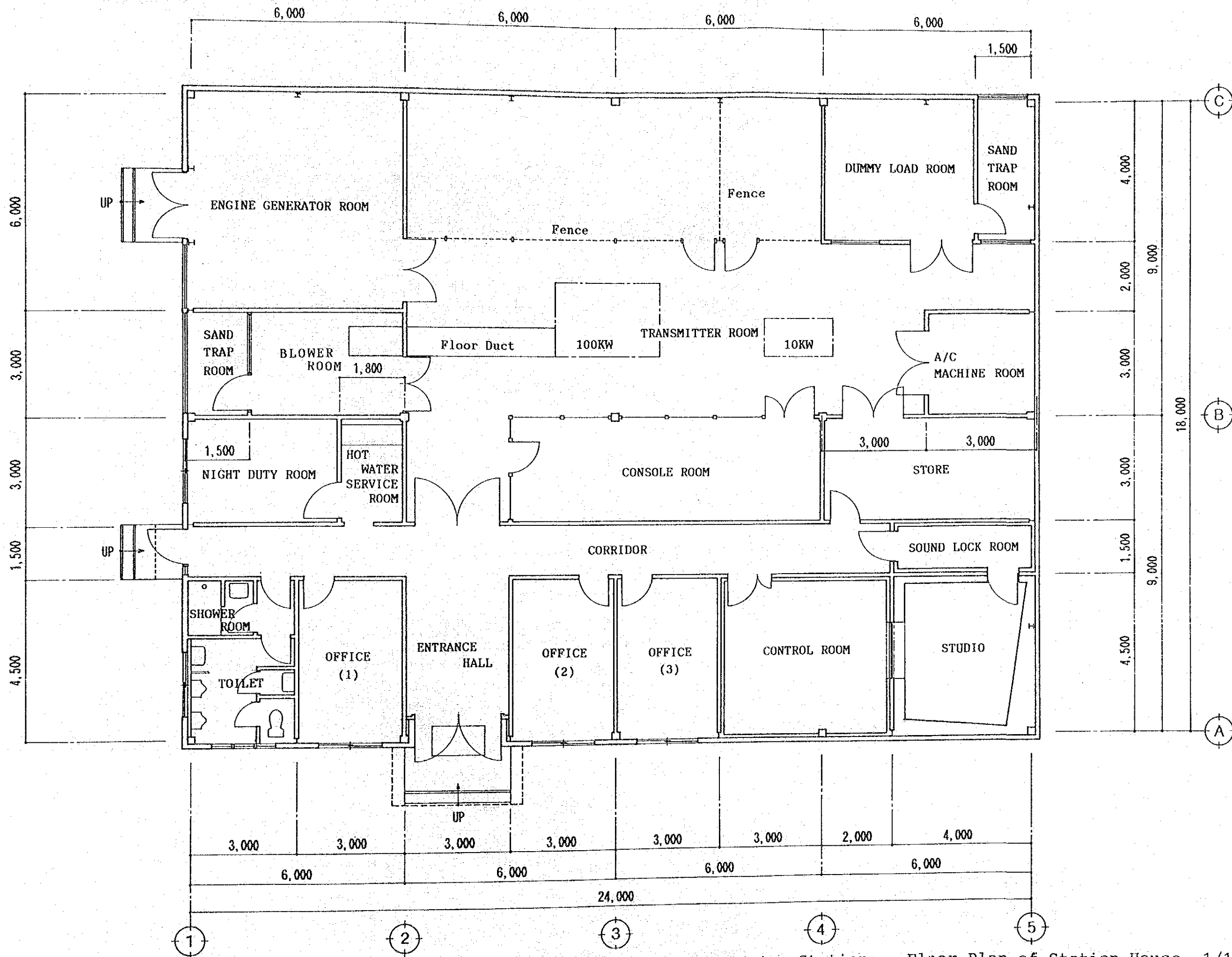
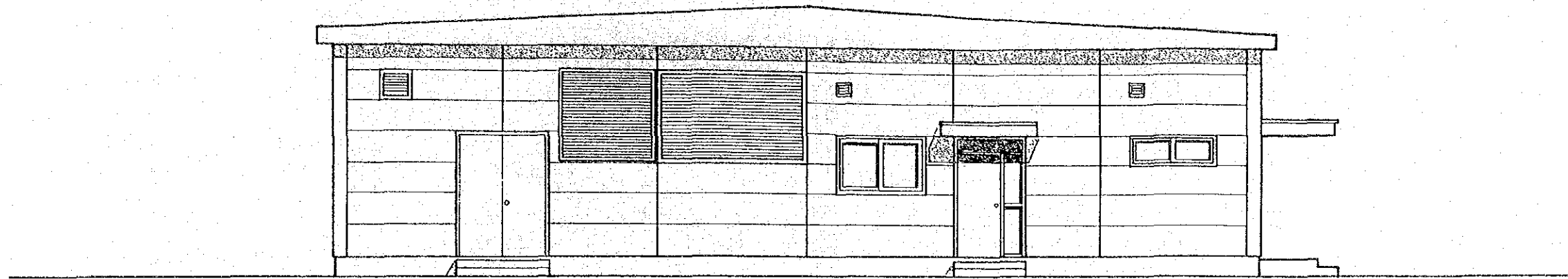
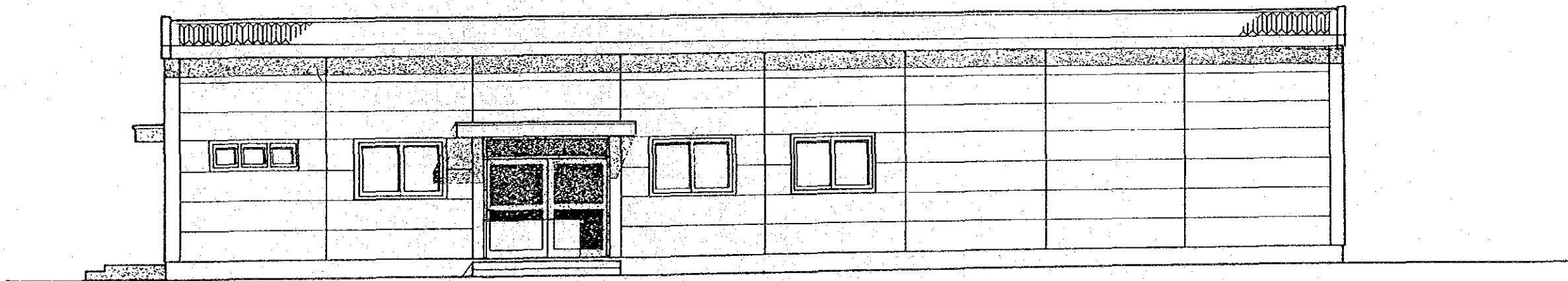


Fig. 3-4-12 Surkhet Broadcasting Station; Floor Plan of Station House 1/100

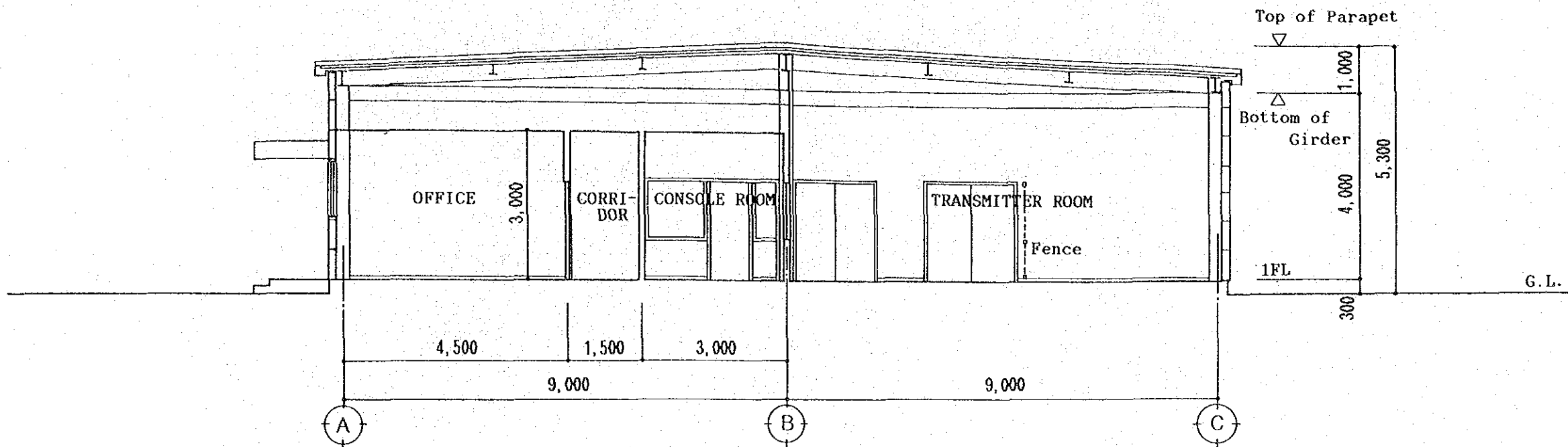


SIDE ELEVATION 1/100

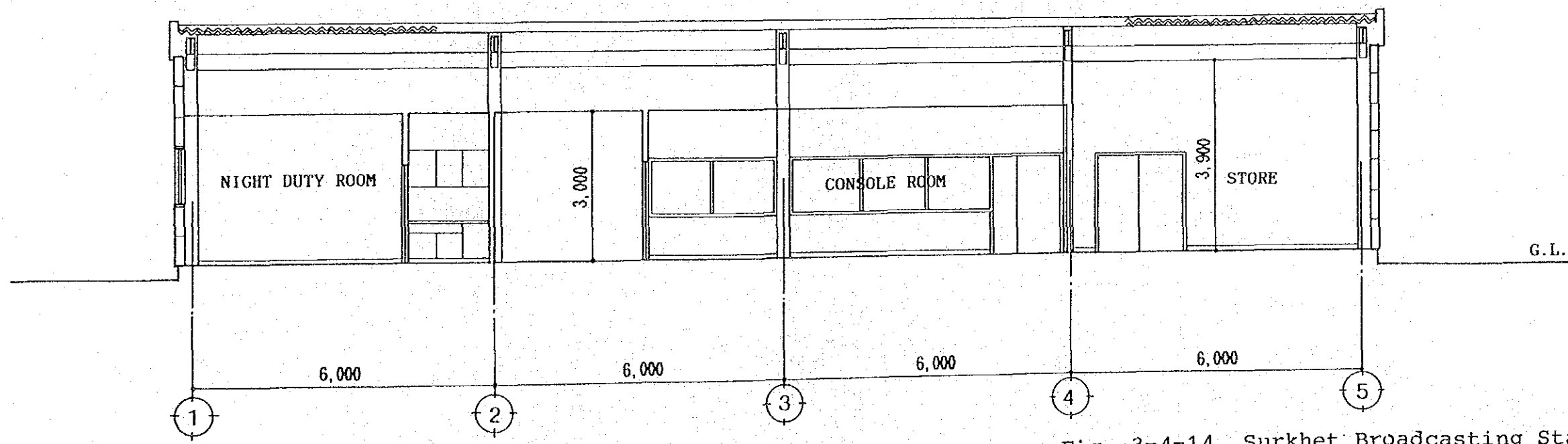


FRONT ELEVATION 1/100

Fig. 3-4-13 Surkhet Broadcasting Station;
Elevation of Station House 1/100

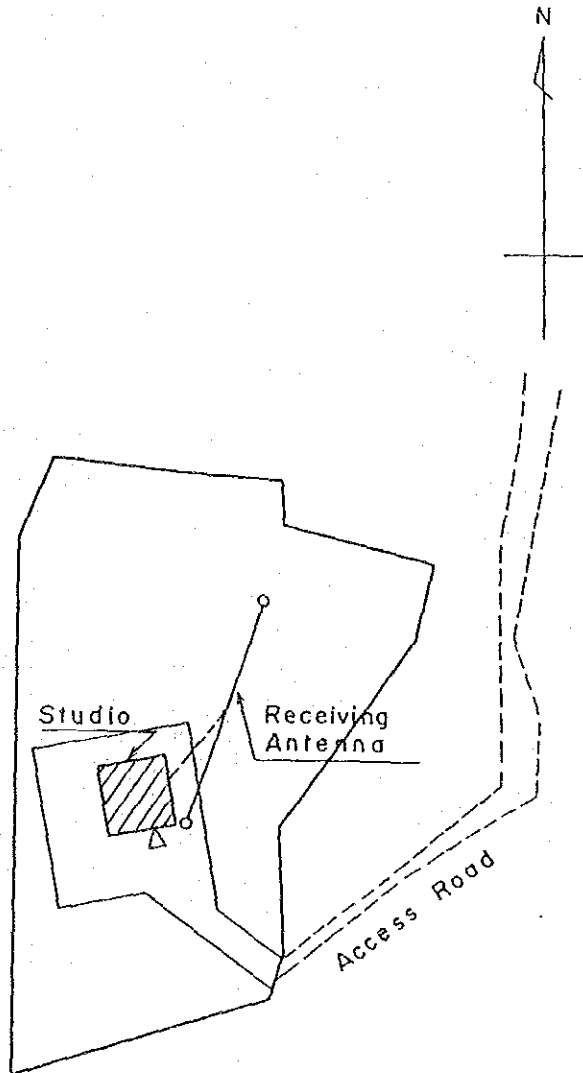


X-X SECTION 1/100



Y-Y SECTION 1/100

Fig. 3-4-14 Surkhet Broadcasting Station;
Section of Station House 1/100



Scale: 1/1,250

Fig. 3-4-15 Dhankuta Studio; Site Plan

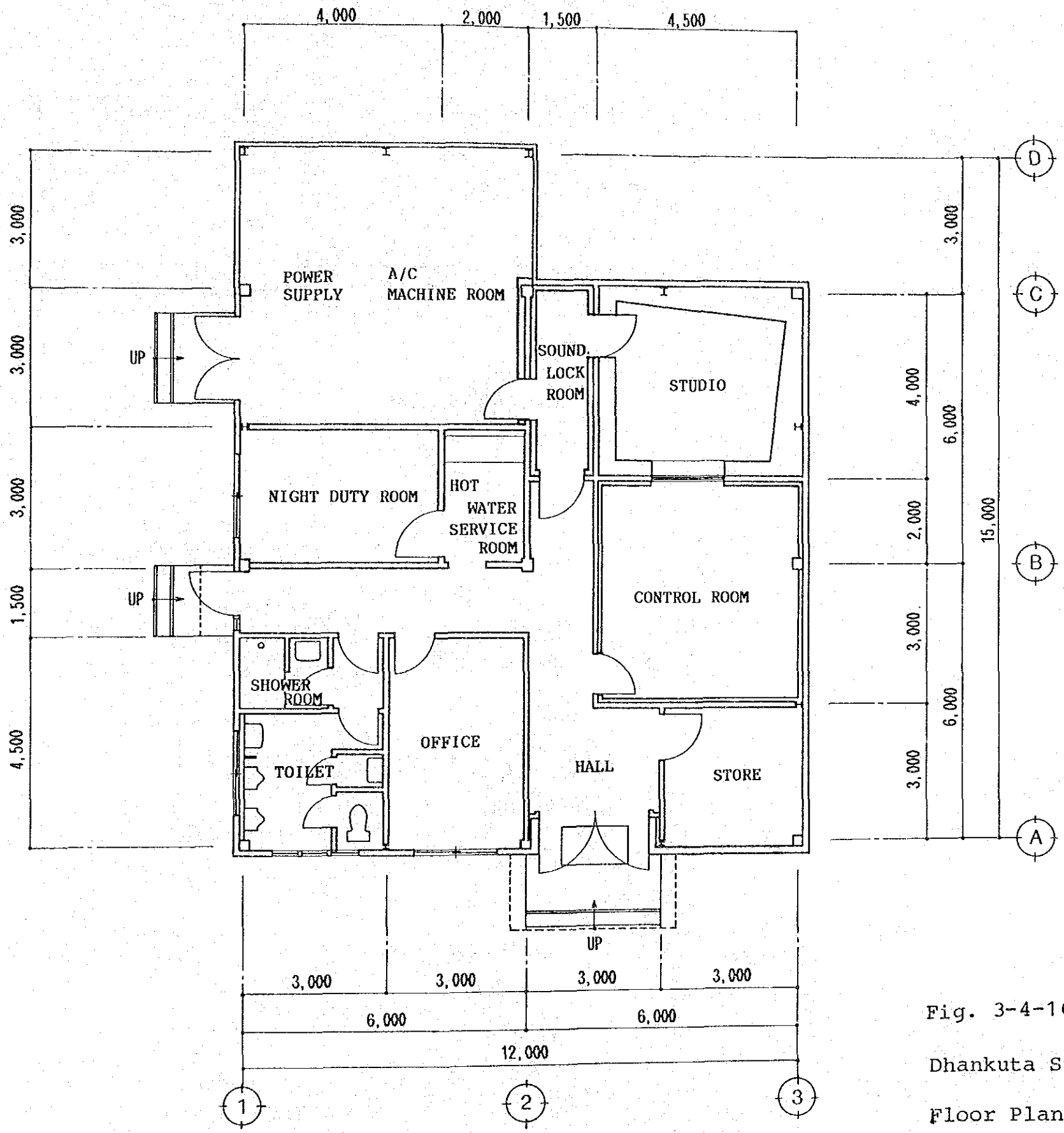
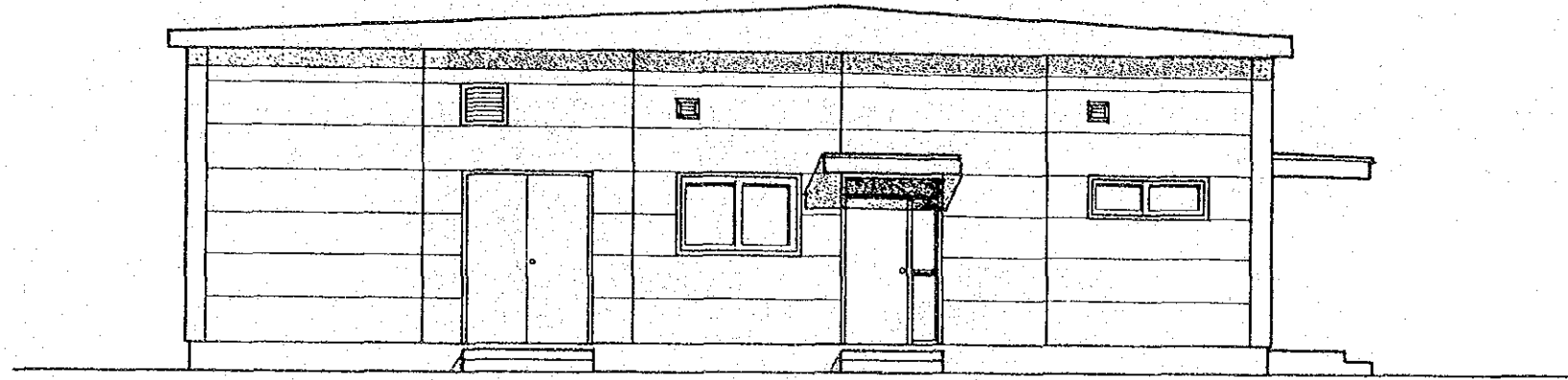
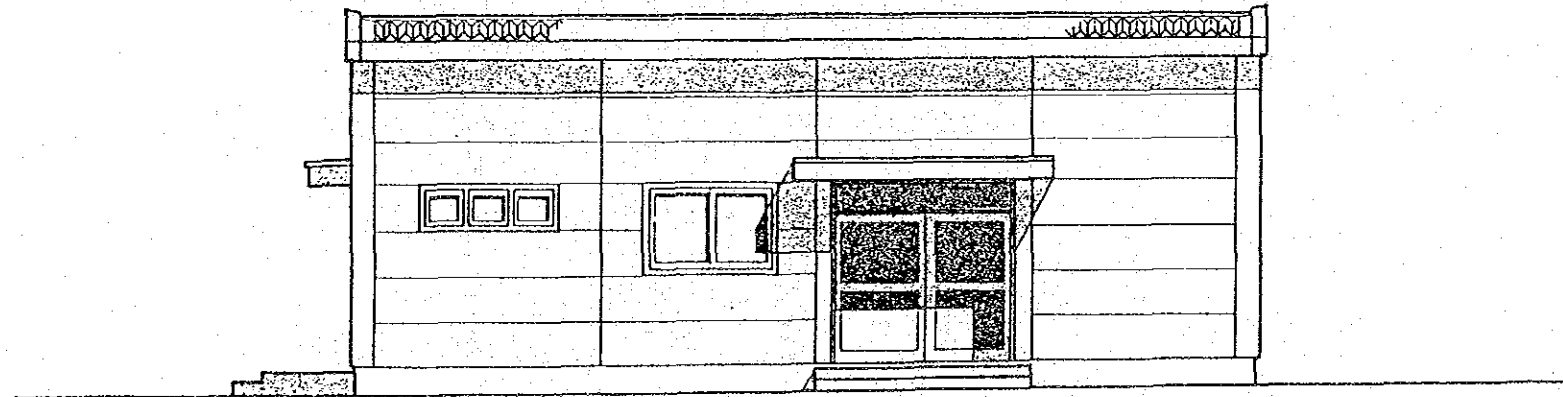


Fig. 3-4-16
 Dhankuta Studio;
 Floor Plan of Station House 1/100

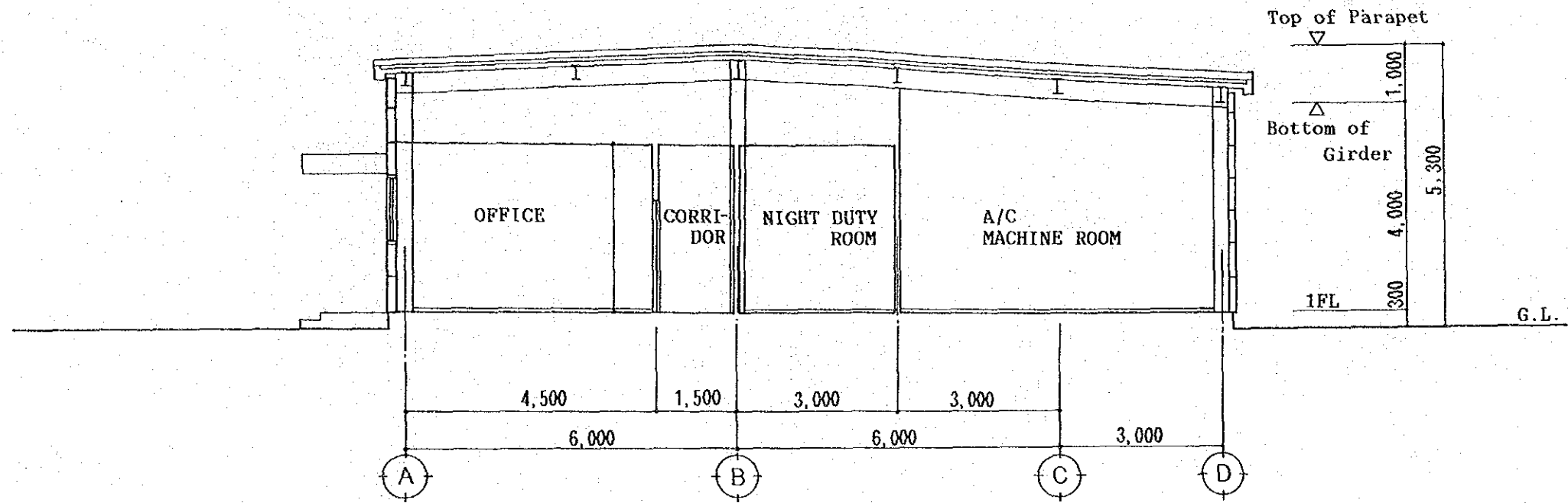


SIDE ELEVATION 1/100

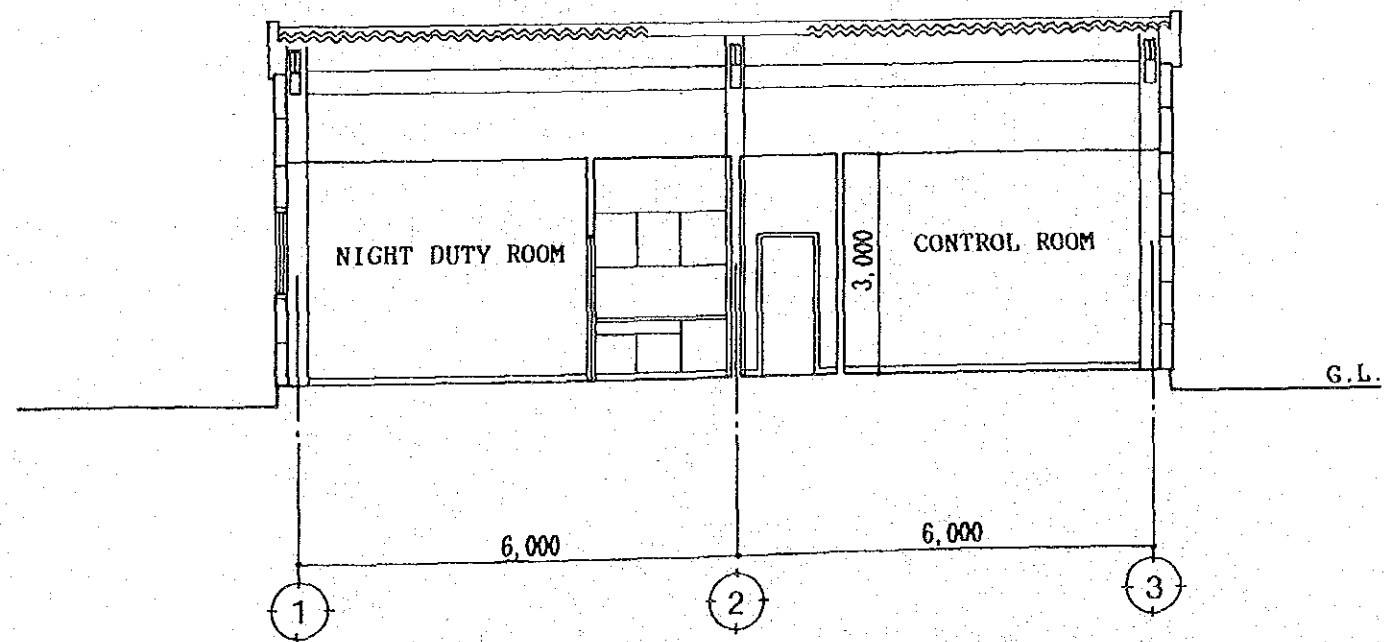


FRONT ELEVATION 1/100

Fig. 3-4-17 Dhankuta Studio;
Elevation of Station House 1/100

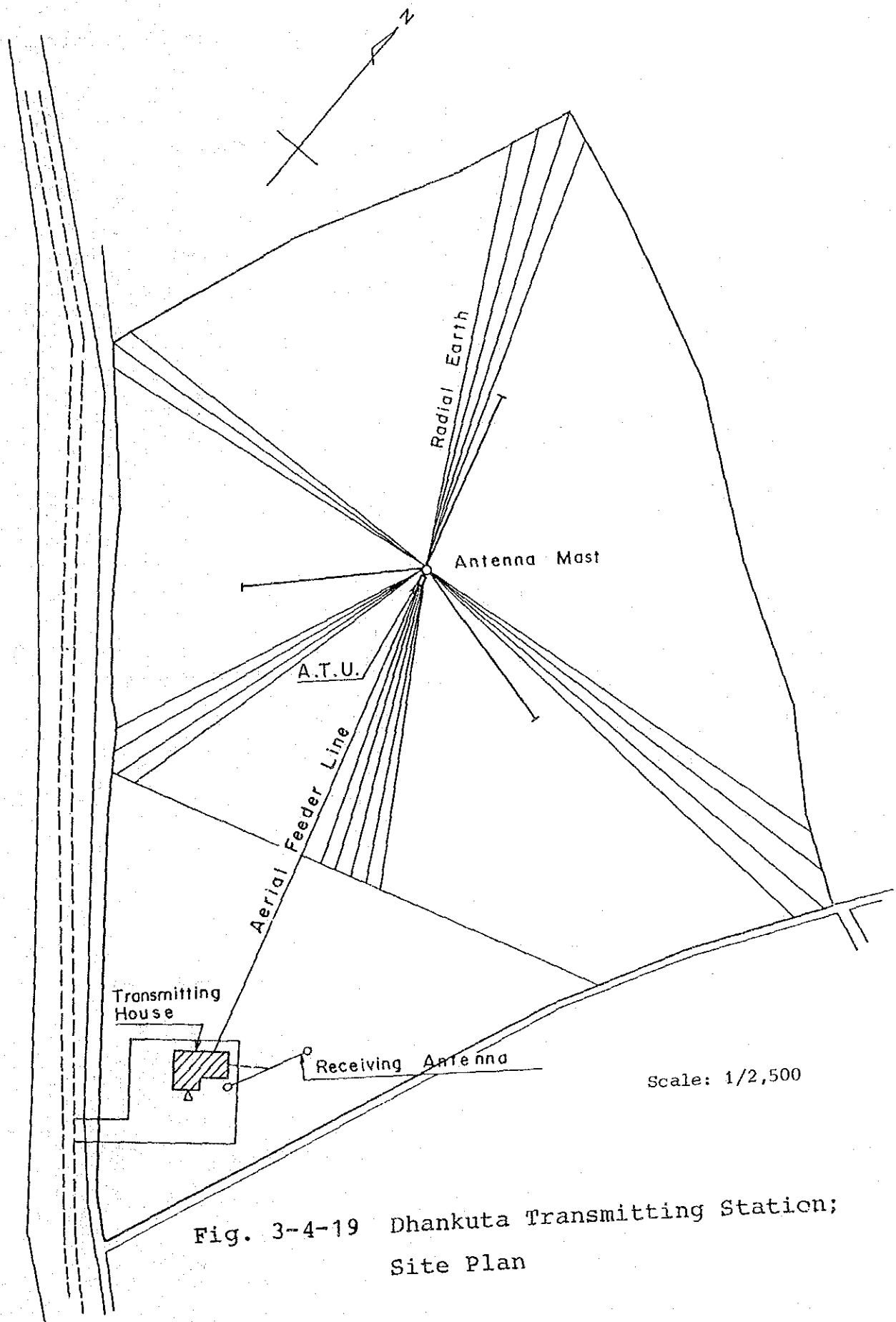


X-X SECTION 1/100



Y-Y SECTION 1/100

Fig. 3-4-18 Dhankuta Studio;
Section of Station House 1/100



Scale: 1/2,500

Fig. 3-4-19 Dhankuta Transmitting Station;
Site Plan

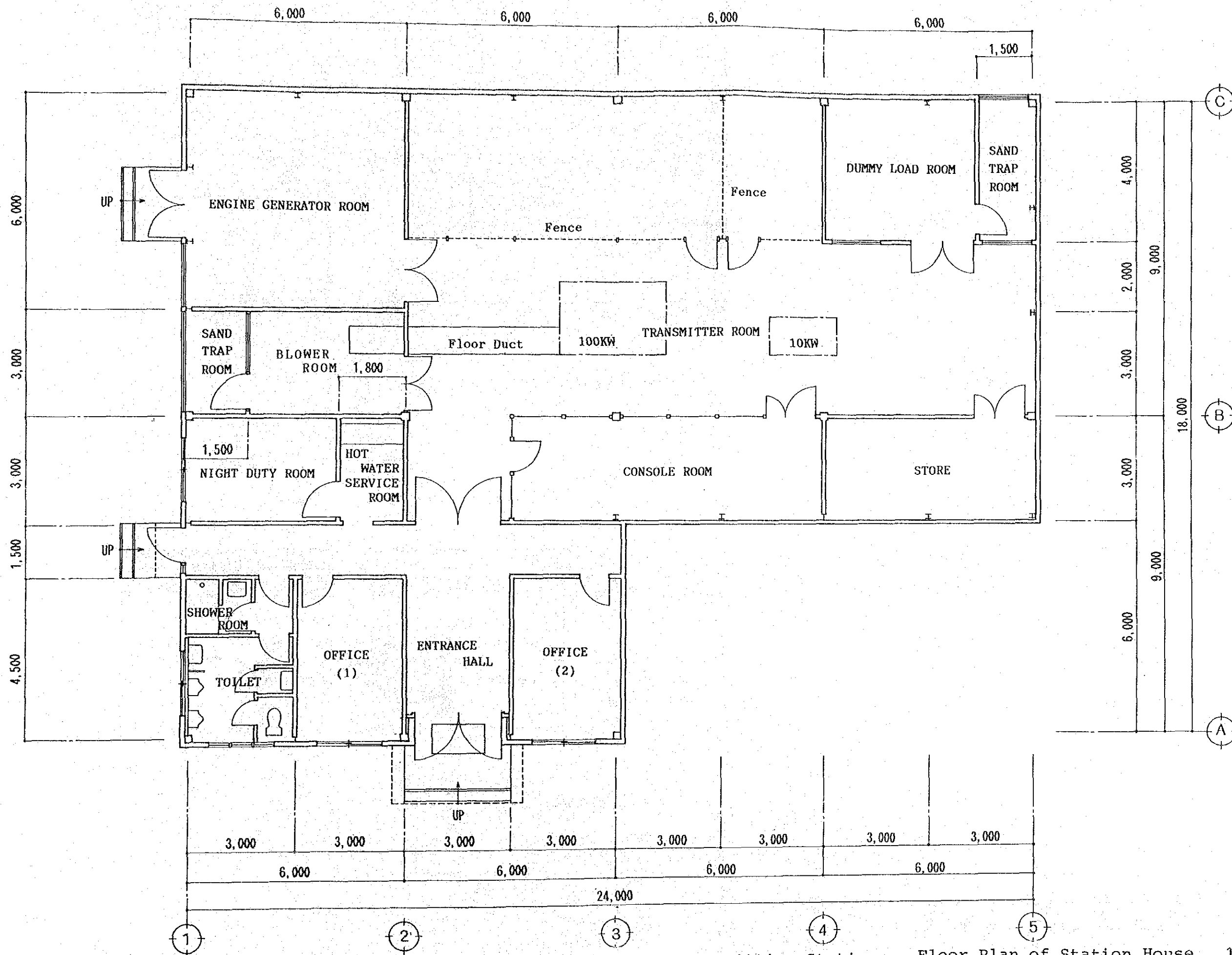
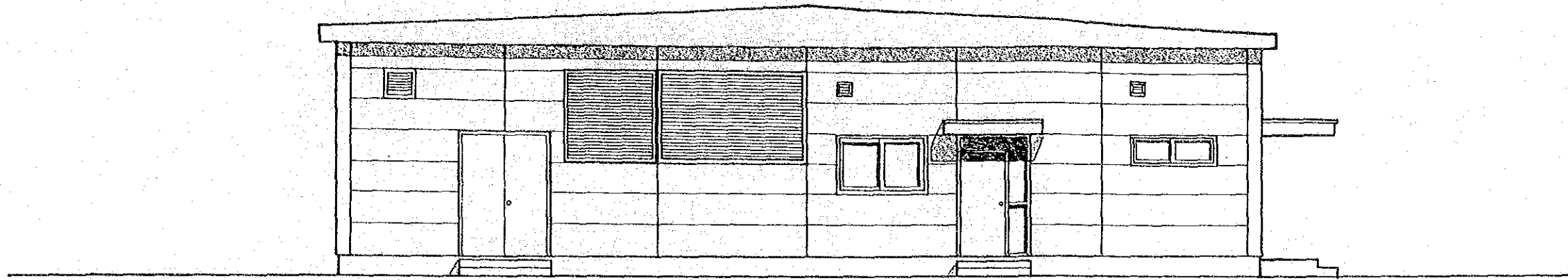
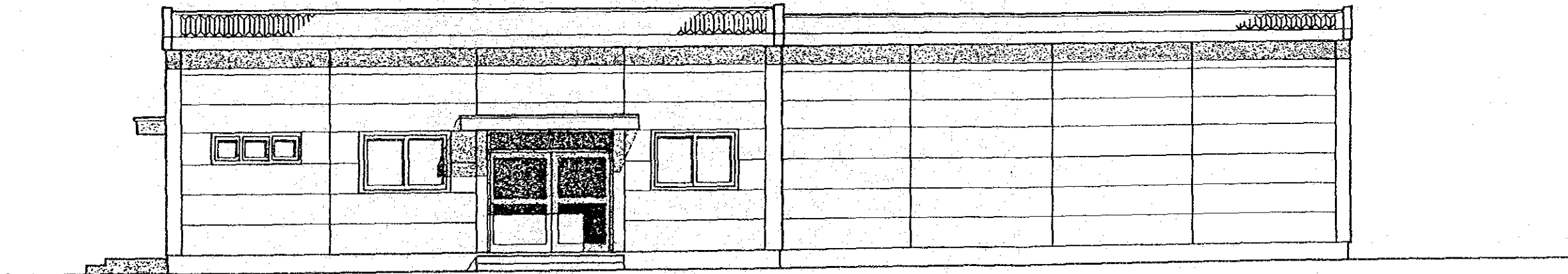


Fig. 3-4-20 Dhankuta Transmitting Station; Floor Plan of Station House 1/100

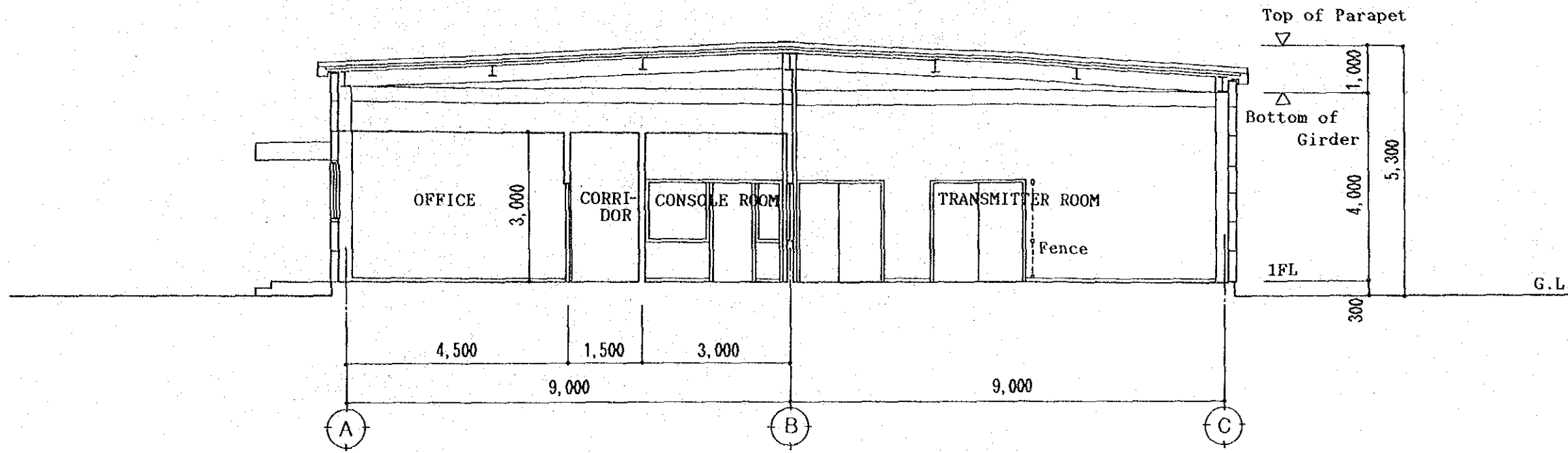


SIDE ELEVATION 1/100

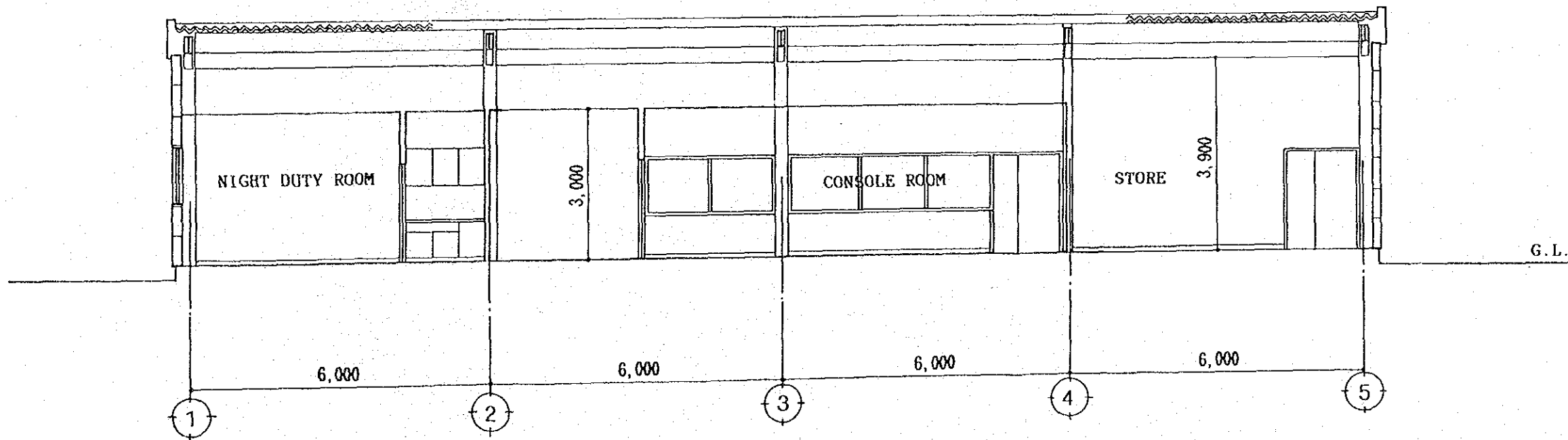


FRONT ELEVATION 1/100

Fig. 3-4-21 Dhankuta Transmitting Station;
Elevation of Station House 1/100



X-X SECTION 1/100



Y-Y SECTION 1/100

Fig. 3-4-22 Dhankuta Transmitting Station;
Section of Station House 1/100

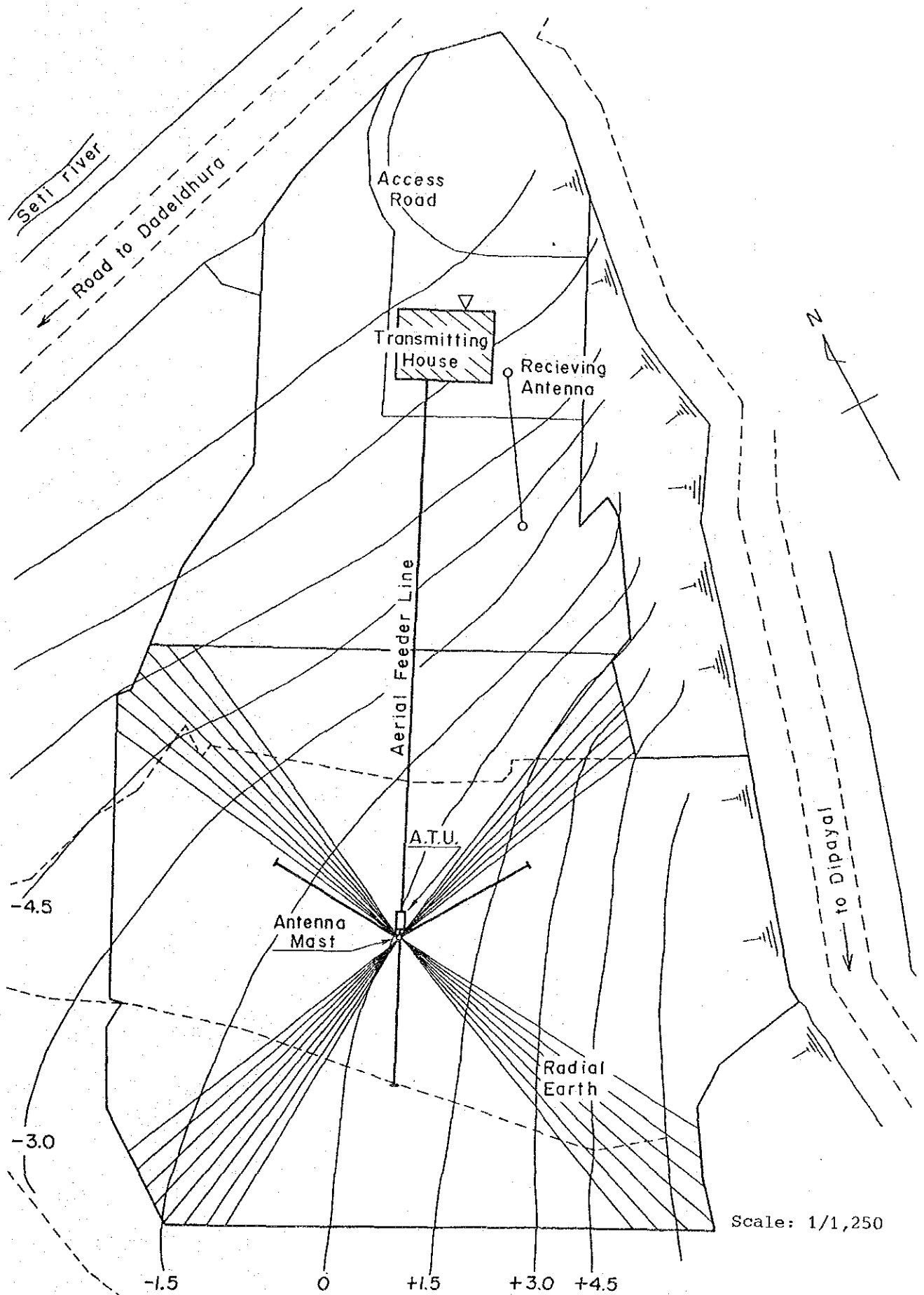


Fig. 3-4-23 Dipayal Broadcasting Station; Site Plan

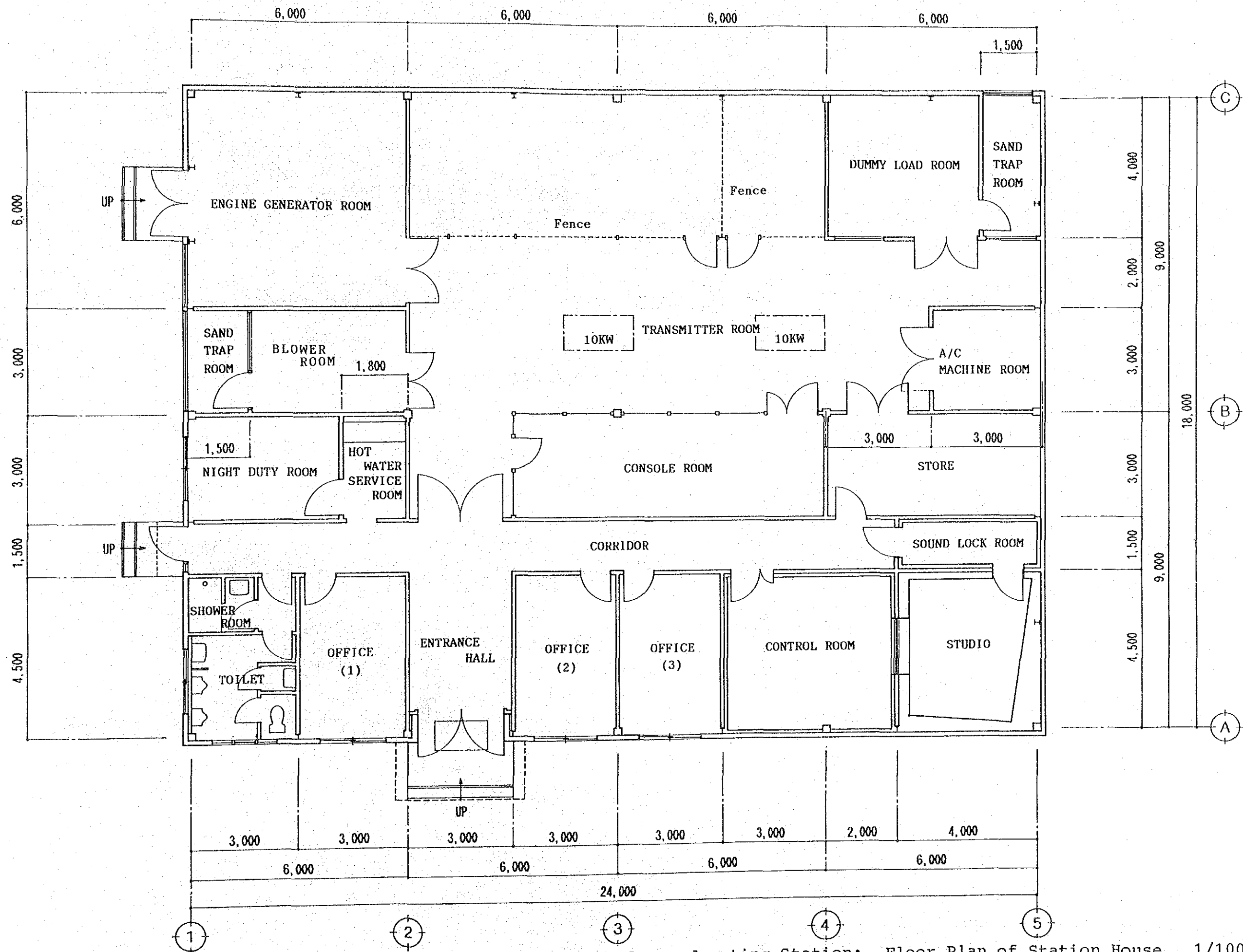
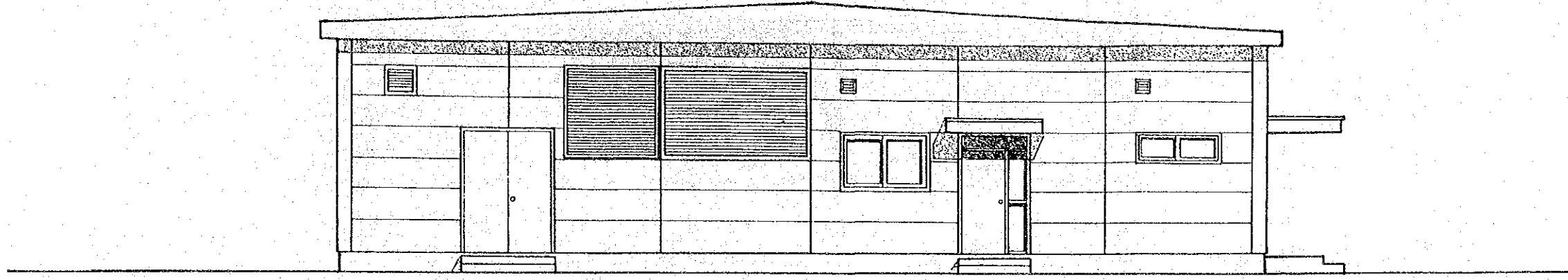
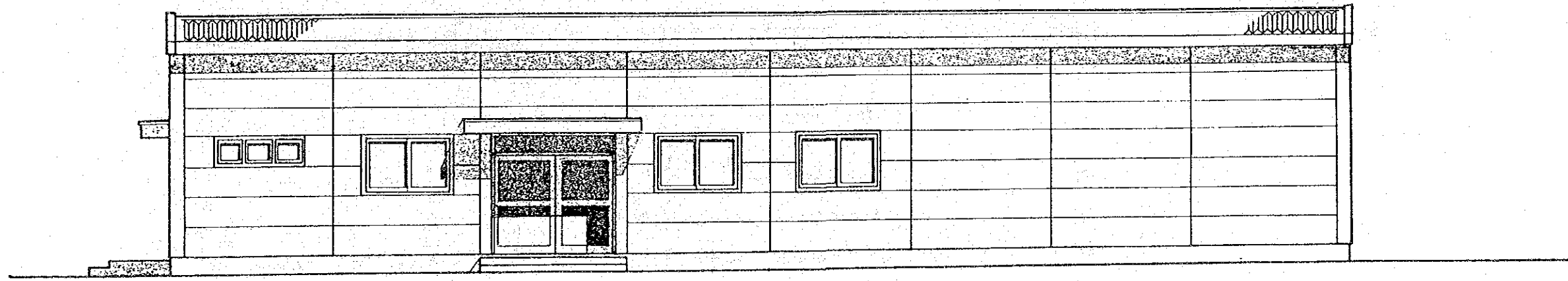


Fig. 3-4-24 Dipayal Broadcasting Station; Floor Plan of Station House 1/100

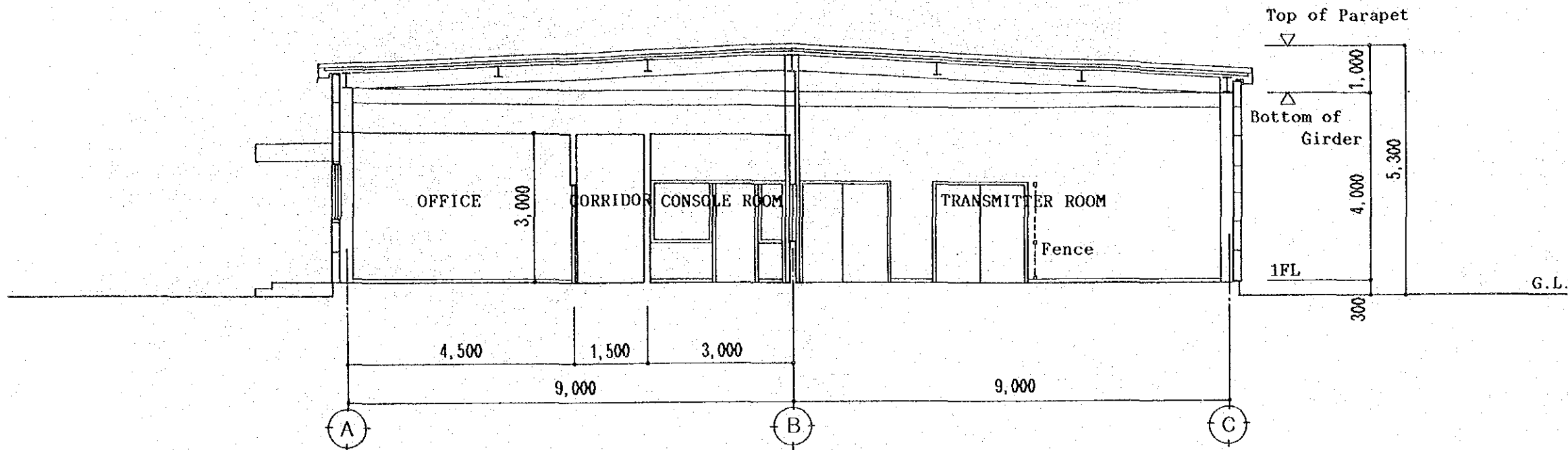


SIDE ELEVATION 1/100

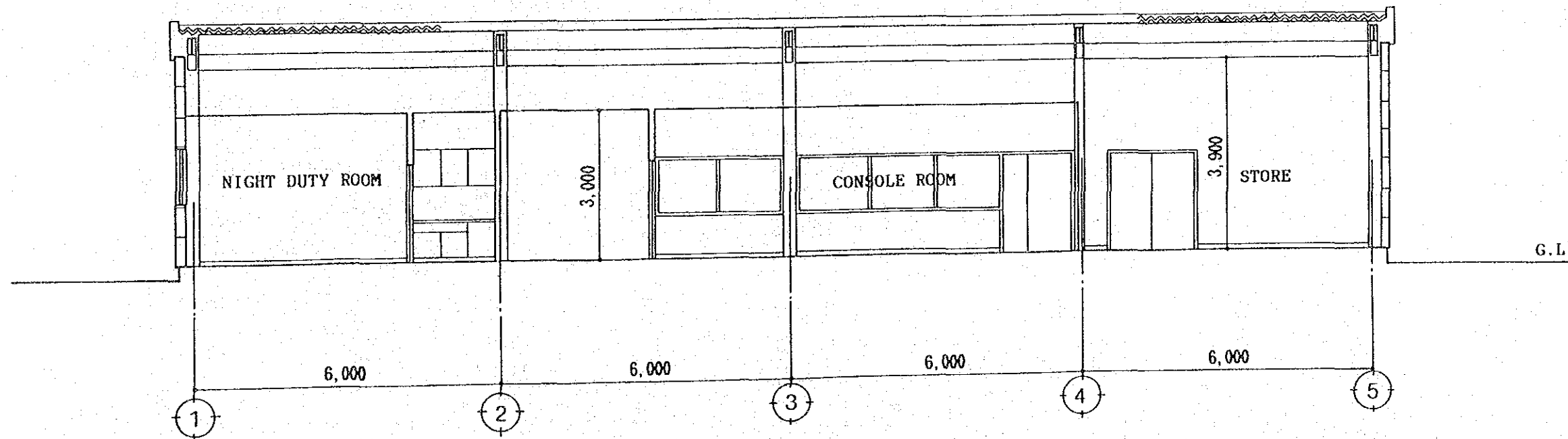


FRONT ELEVATION 1/100

Fig. 3-4-25 Dipayal Broadcasting Station;
Elevation of Station House 1/100

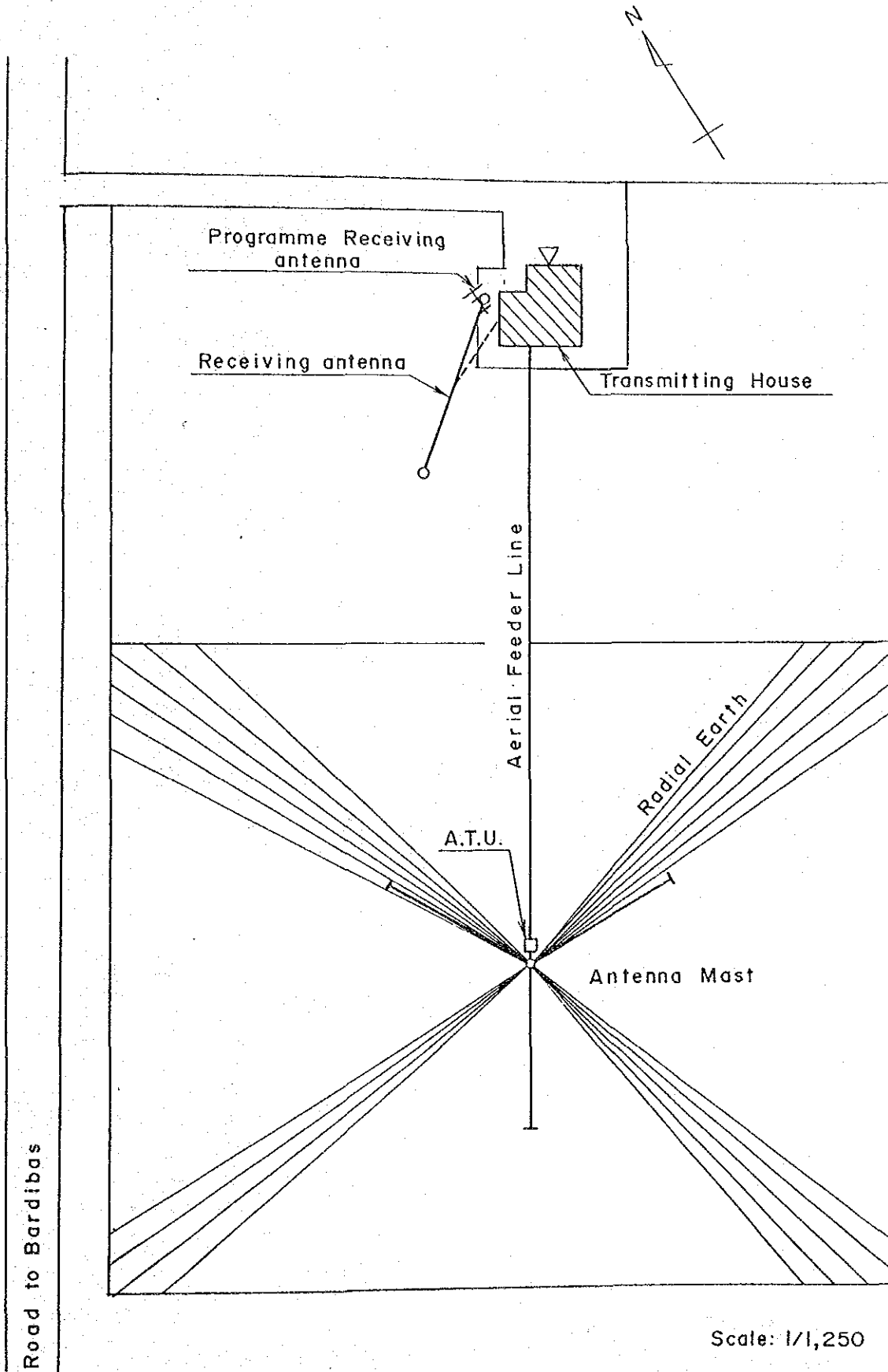


X-X SECTION 1/100



Y-Y SECTION 1/100

Fig. 3-4-26 Dipayal Broadcasting Station;
Section of Station House 1/100



Scale: 1/1,250

Fig. 3-4-27 Dhalkebar Transmitting Station;
Site Plan

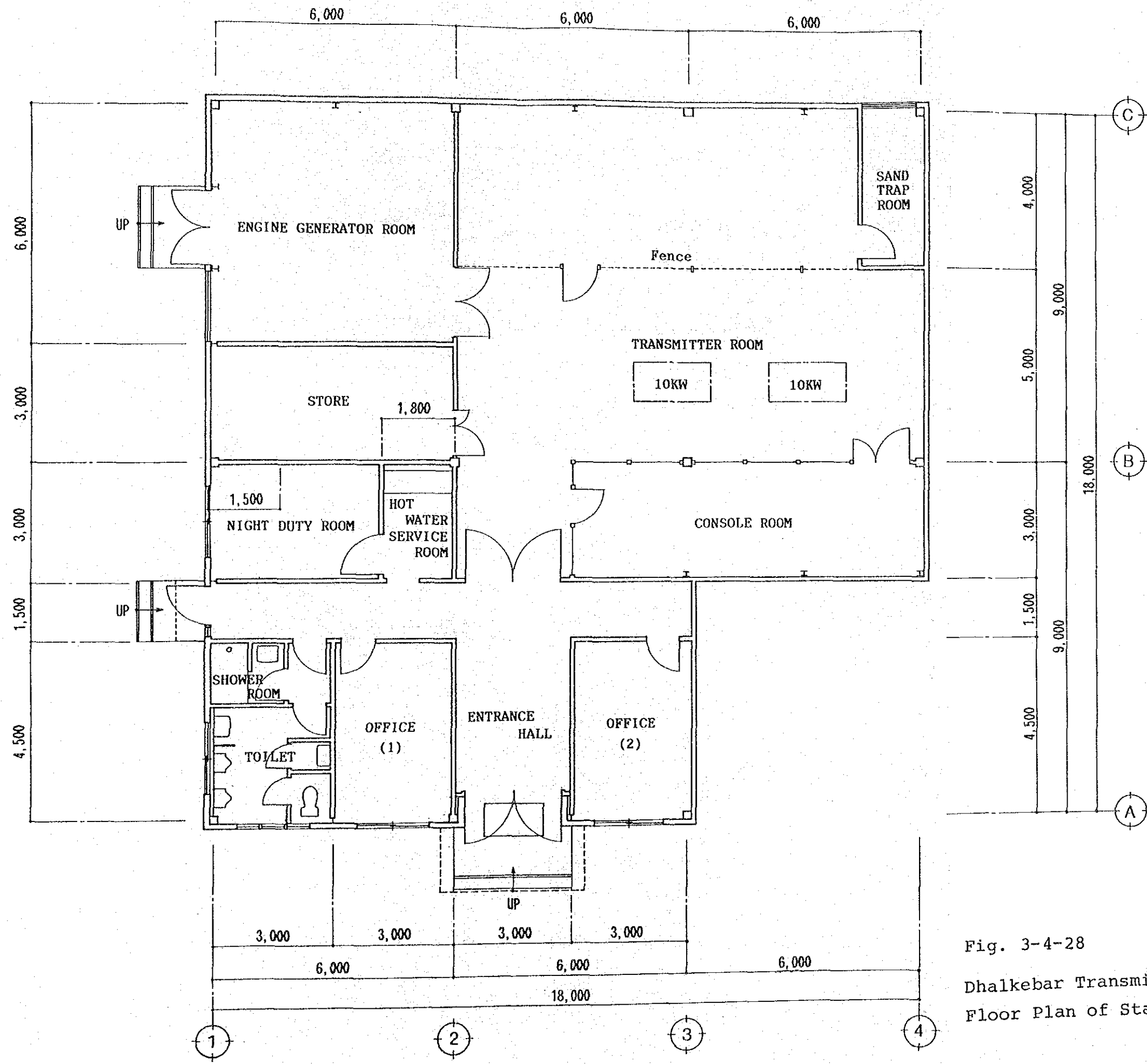
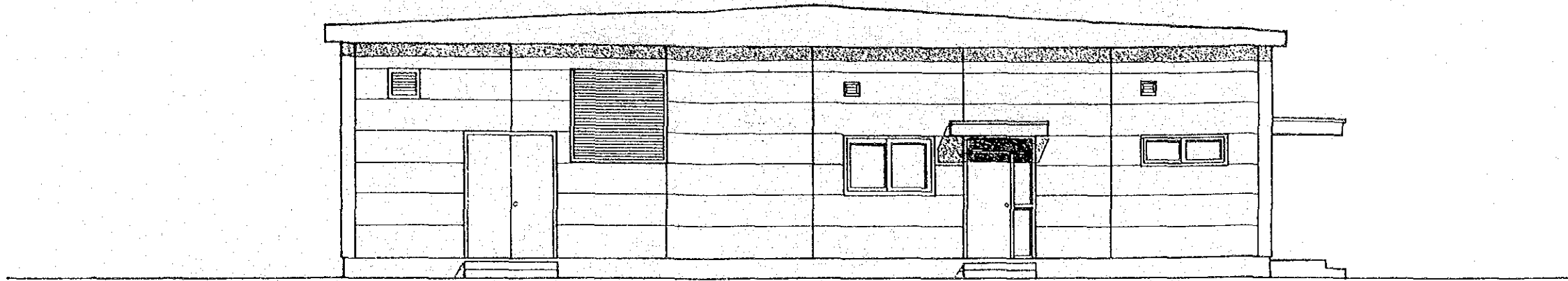
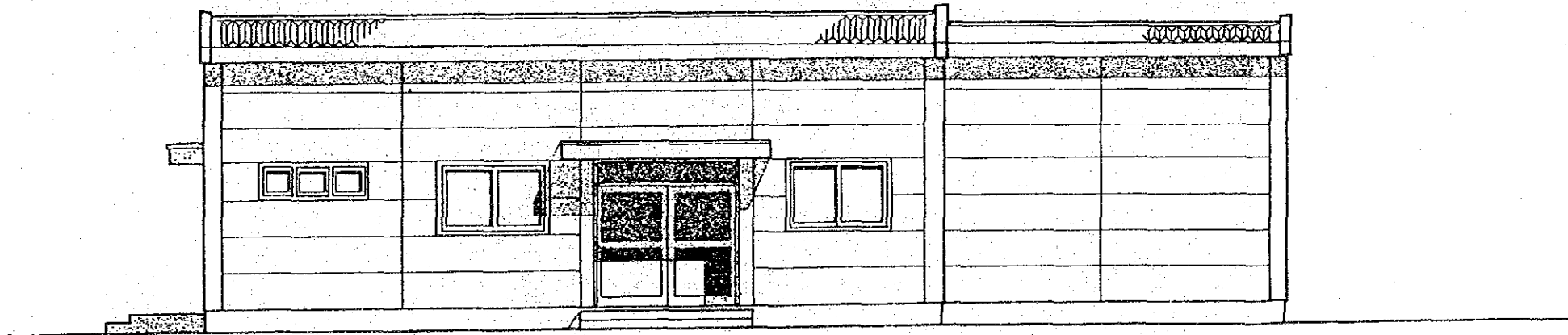


Fig. 3-4-28
 Dhalkebar Transmitting Station;
 Floor Plan of Station House 1/100

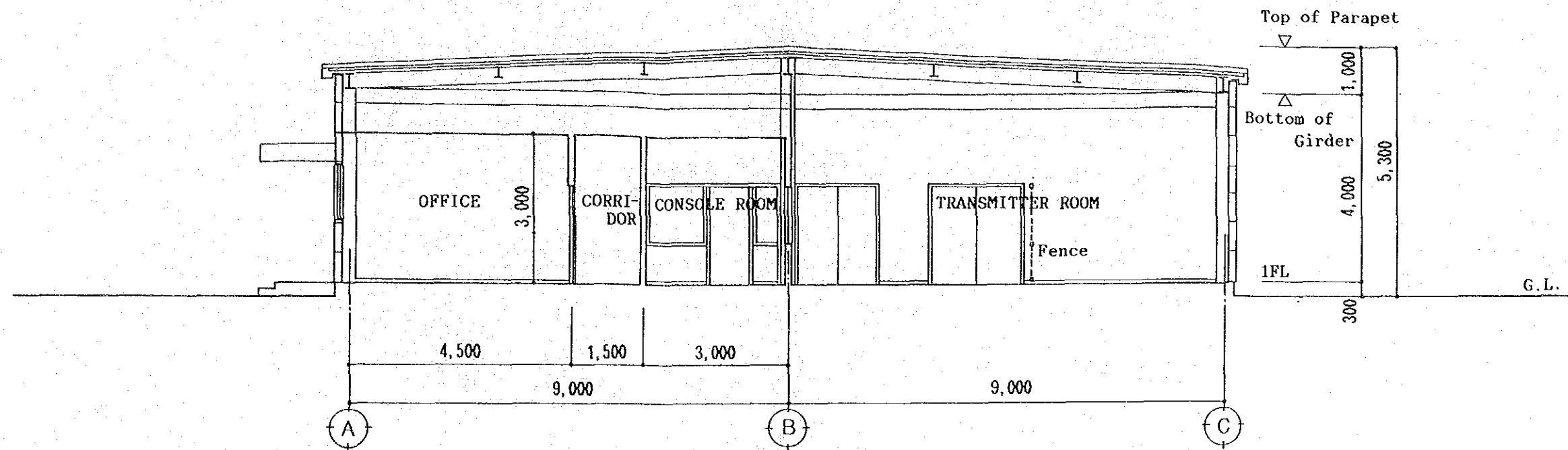


SIDE ELEVATION 1/100

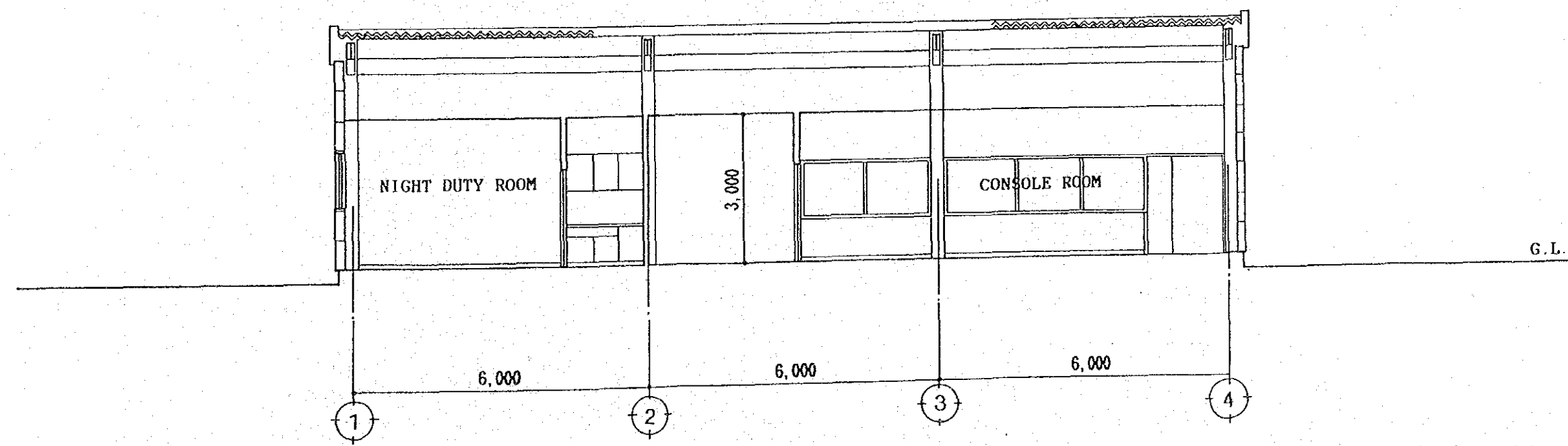


FRONT ELEVATION 1/100

Fig. 3-4-29 Dhalkebar Transmitting Station;
Elevation of Station House 1/100



X-X SECTION 1/100



Y-Y SECTION 1/100

Fig. 3-4-30 Dhalkebar Transmitting Station;
Section of Station House 1/100

3-5. Execution Plan

3-5-1 Executing Body

The executing body of this Project on the part of Nepal is Radio Broadcasting Service (Radio Nepal) headed by Mr. Prachanda M.S. Pradhan.

Radio Nepal, as described in 2-4, Present Status of Radio Nepal, has been performing the radio broadcasting activities with well-maintained organization and skillful staff, and their maintenance and operational conditions over Kathmandu Station and Pokhara Station completed in 1983 by Japan's grant aid cooperation are so excellent that their technical and administrative capabilities are highly estimated. Therefore, it is considered that the staff are quite eligible as the executing body of this Project.

3-5-2 Current State of Building Industry and Construction Guideline

Airport buildings in the city of Kathmandu are now under construction by Japanese construction firms with the capital assistance from Asian Development Bank. Similarly, some large-scale civil engineering works (such as dam and road construction) are also underway in local areas with assistance from foreign countries. Three to four-storied housing made of brick mostly can be seen in and around Kathmandu but most houses in rural areas are of either one-storied or two-storied type made of stone.

There are some Nepalese construction firms also in the country but they are working as subcontractors for foreign construction firms. In this Project, all of the proposed sites are located in local areas, thus it seems difficult to secure a variety of skillful workers for a long period of time. Accordingly, it becomes important to minimize work requiring high skills on site.

As for material procurement, cement is produced in domestic factories and it has no problem in both quality and quantity, but the

basic materials such as steel frames and reinforcing bars are expensive and short in supply, thus it seems difficult to secure them enough. Other interior and exterior materials are mostly imported and expensive, thus the quantity to be supplied is uncertain.

Such laws as Building Standard Law and City Planning Law of Japan have not been established in Nepal yet. Laws concerning the building industry and its state such as Industrial Enterprises Act, 1987, Company Act, 1984, etc., are available but provisions of building control and building standards cannot be found. IS (Indian Standard) and BS (British Standard) are used as industrial standards for building materials.

From these situations and the scale of the station house, a prefabricated system of steel frame construction is employed for this Project.

3-5-3 Allotment of Scope of Work

Outline of allotment of scope of works for the execution of this programme by the Government of Japan and His Majesty's Government of Nepal is as follows.

(1) The scope of the works covered by the Government of Japan:

1) Equipment

- Manufacturing, installation and wiring of broadcasting equipment.
- Manufacturing, foundation work and erection of antennas.
- Manufacturing, foundation work and fabrication of station houses.

2) Basic Work

- Water supply (in the site)
- Electricity
- Telephone (ducts, pipes, terminal boxes and outlet boxes inside the station house)

3) External Work

- Parking area and in-site road
- Drainage (in the site)
- Septic tank

4) Associated Work

- Transportation between Japan and the proposed sites in the Kingdom of Nepal.

(2) The scope of the works covered by His Majesty's Government of Nepal.

1) Site and External Work

- Acquisition of the lands for each site
- Clearance and demolishing of the lands for each site
- Fencing
- Landscaping

2) Basic Work

- Provision of power supply, water supply and a telephone line to the site

3) Furniture and Utensils

- Procurement of necessary furniture and utensils

4) Steps, Commission, etc.

- Bank commissions on the bank agreement
- The expenses on the exemption of tax and tariffs
- Undertakings on the customs clearance and inland transportation
- Exemption of tax and tariffs on the Japanese nationals who work for the purpose of executing the Project under the agreement/contract approved by the Government of Japan
- Undertakings to the above mentioned Japanese nationals for getting permission for their entry, departure and stay for the purpose of their work on the Project
- Maintenance and operation to operate and maintain the equipment and facilities properly and effectively which have been supplied and installed through Japan's grant aid.

3-5-4 Execution Supervision Plan

In this Project, various works are conducted such as the construction of radio broadcasting stations in which medium wave transmitters, studio equipment, and the related power equipment are

installed, and the erection of the transmitting antenna masts of 60m and 120m high and a prefabricated house.

In order to carry out the above various works smoothly and efficiently within the specified time frame of the works, it is necessary to send in appropriate specialists timely. Also it is common to all projects that transportation influences the time period of the work. Much sophisticated equipment is to be transported in this Project, thus requiring much attention.

From these points, it is necessary to select well-experienced contractors and examine and set the stages of execution of the work very carefully. It is also necessary to exchange information sufficiently with the Nepalese so that this Project can be executed smoothly as a joint undertaking.

Consultants make the detailed design, assigning of appropriate staff for supervision of the work, coordinate closely with not only related organizations of the Japanese side but also those of the Nepalese side to make the execution of the work go smoothly. Also they give appropriate and timely advice and guidance concerning the various problems that may occur or matters concerning safety.

3-5-5 Materials and Equipment Procurement Plan

All of the broadcasting equipment, their related equipment and construction materials shall be procured in Japan.

The broadcasting equipment and their related equipment shall be inspected after assembly (factory inspection) in Japan as units or a system, and transported after being disassembled again as appropriate. After arrival at the site, equipment installation work shall be done and then the equipment shall be reassembled.

The transmitting house shall be of pure steel frame construction, and of prefabricated design using autoclaved light-

weight concrete panels for the external walls and a folded structure of galvanized sheet iron for the roof.

A shelter shall be used for the tuning unit hut, of which the inside shall be shielded with aluminum plates. All of the above shall be procured in Japan.

Foundations for the transmitting house and antenna mast shall be made on site. Cement and aggregate shall be procured on site but reinforcing bars shall be procured in Japan.

3-5-6 Execution Schedule

The necessary procedures to be taken for the execution of this Project are:

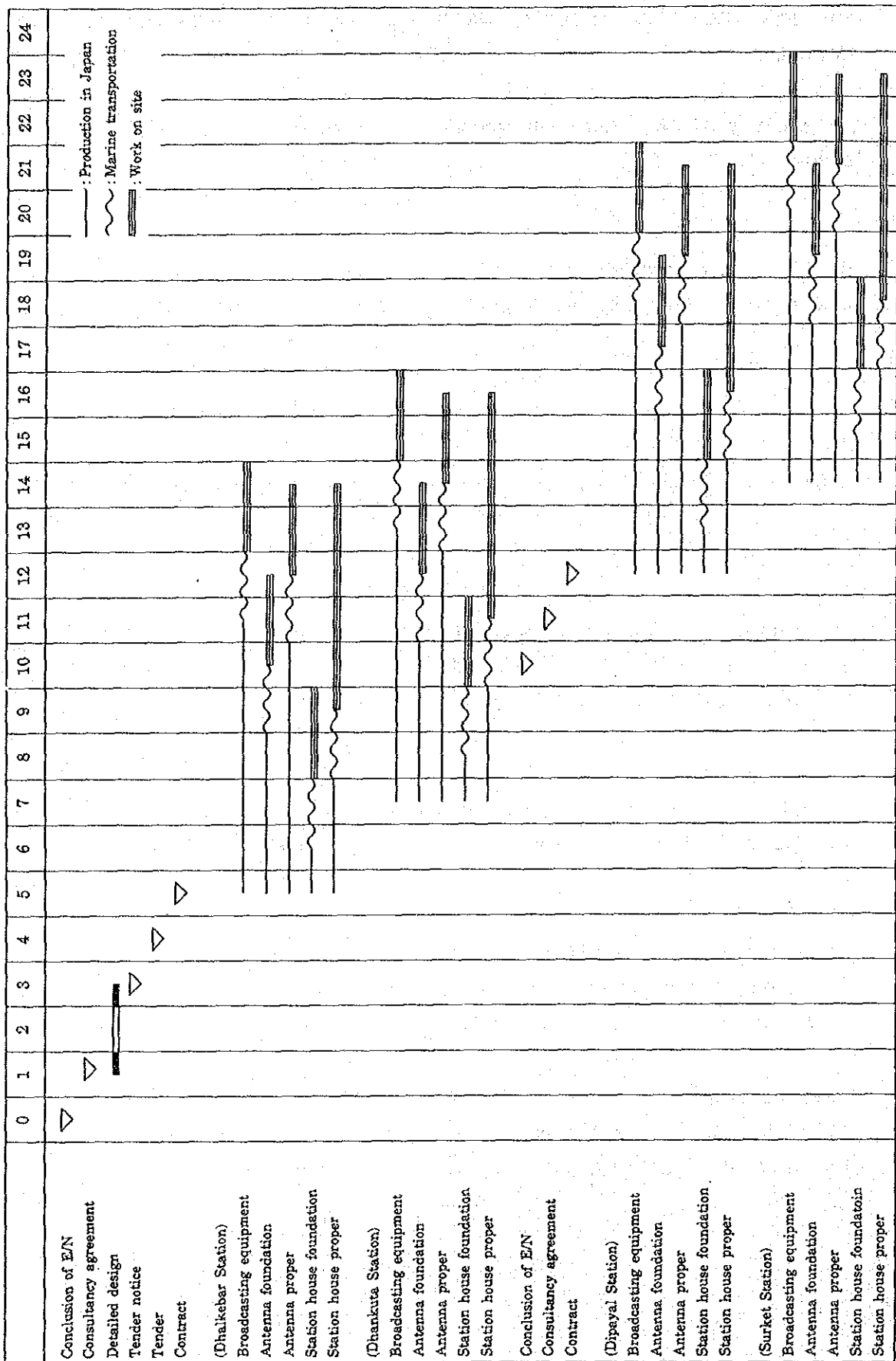
- after the conclusion of Exchange of Notes between His Majesty's Government of Nepal and the Government of Japan, a Japanese consultant firm is appointed by His Majesty's Government of Nepal and the Contract for the consulting service is concluded between them,
- after that the Detailed Design and the preparation of the Tender Documents are carried out by the consultant and the Tender is taken place,
- after the evaluation of the Tender, a Contract for the execution of the Project is concluded between His Majesty's Government of Nepal and Japanese contractor, and the construction work begins.

The term of the execution of this Project will be divided into two phases. In the first phase Dhankuta and Dhalkebar stations will be constructed, and Surkhet and Dipayal stations will be in the second phase.

The total term including the 1st phase and the 2nd phase will be 18 months.

The summary of the execution schedule is shown in Table 3-5-1.

Table 3-5-1 Execution Schedule



3-5-7 Project Cost Estimates

Project costs covered by the Nepalese side are estimated as follows:

Approx. 49.5 million NRs including expenses concerning site purchase, electric cables, telephone cables, water piping works, site fencing which are directly related to this Project.

The breakdown by each proposed site is as follows:

Surkhet	16,200,000 NRs
Dhankuta	16,100,000 NRs
Dipayal	6,900,000 NRs
<u>Dhalkebar</u>	<u>10,300,000 NRs</u>
Total	49,500,000 NRs

3-5-8 Management and Maintenance Plan

(1) Personnel Plan

The number of staff for the newly established stations is estimated as in Table 3-5-2, by referring to the existing Pokhara Station:

Table 3-5-2 Personnel Plan

Item	Surkhet	Dhankuta	Dipayal	Dhalkebar	Total
Manager	1	1	1	1	4
Programme	3	3	2	—	8
News	2	2	1	—	5
Engineering	12	15(12+3)	12	10	49
Administration	3	4	3	2	12
Total	21	25	19	13	78

* It is necessary to increase programming (programme production engineering) staff and news editors after the Project came into operation because of the programming control policy of Radio Nepal which stresses the strengthening of local programmes.

Some of the staff will be transferred from the present Kathmandu Station and Pokhara Station but recruitment of new staff is necessary in any case. In addition, a staff training programme should be worked out and initiated as soon as possible.

Besides this table, watchmen, janitors, etc. may be required.

(2) Maintenance and Operation Expenses

Annual maintenance and operating expenses after completion of this Project are estimated as in Table 3-5-3, referring to the actual results of Pokhara Station:

Table 3-5-3 Running Expenses

(Unit : 1,000 NRs)

Item	Surkhet	Dhankuta	Dipayal	Dhalkebar	Total
Personnel Expense	252	300	228	156	936
Electricity Expense	1,200	1,200	360	360	3,120
Stationary Expense	48	48	48	48	192
Programme Line Fee	96	96	96	96	384
Maintenance Parts Fee	156	156	156	96	564
Total	1,752	1,800	888	756	5,196

Note)

- 1) Personnel expenses are calculated by assuming an annual average income be 12,000NRs.
- 2) Power rate for 100kW stations is based on Pokhara Station and 10kW station based on about 30% of Pokhara Station in view of its capacity.
- 3) Offices and utility expenses and programme relay link charge are based on those of Pokhara Station.
- 4) Expenses of expendable parts are estimated by adding the actual result of Pokhara Station to the tape expense, etc., for the station with a studio annexed.

3-5-9 Technical Cooperation

As aforementioned, Radio Nepal has kept the present broadcasting equipment both for transmitting and programme production in excellent condition and their technical level is highly estimated, thus special technical training is not necessary. But it is desired to

give enough on-the-job training at the time of installation of the equipment.

Furthermore, rapid technological progress mostly in the field of electronics has been accelerated in the broadcasting engineering, thus the up-to-date technology is incorporated in the equipment for this Project also. In order to cope with this, it is desired to continue the collective training being held so far in Japan.

Radio Nepal strongly wishes to increase the number of trainees of this course considering the future expansion, and to bring Japanese experts to Nepal.

CHAPTER 4 EVALUATION

CHAPTER 4 EVALUATION

Medium wave radio broadcasting is an excellent medium in that it can spread stable audio information over a wide area simultaneously and directly, and it can be received by simple and inexpensive battery-powered receiving sets.

In the Kingdom of Nepal, medium wave radio broadcasting has been drawing attention as the most stable and certain means of spreading information. About 55% of the population is estimated in the present service areas, and the areas are limited only to Central Development Region headquartered in Kathmandu and Western Development Region headquartered in Pokhara.

This Project intends to locate the stations in the centres of Mid-Western, Far-Western and Eastern Development Regions where information has been most seriously unavailable, thus expanding the medium wave radio broadcasting service areas by installing the programme production equipment in each centre so as to make the local-oriented information available and improve the living standards of local people that contribute to social development.

The realization of this Project will enable an additional about seven million people to listen to the medium wave radio broadcasting, which means more than 90% of the entire population will then be covered. Radio broadcasting is the single medium among other mass media to achieve such a big network and it is considered that this will have a great influence upon the Kingdom of Nepal.

Radio Nepal was established in 1951 as a government department. In 1984, it was converted into semi-autonomous organization. Since then continuous efforts have been made to enhance its self-reliance in respect of its management and finance.

On the occasion of the completion of this Project, four new local broadcasting stations will come into operation. It means the scale of the organization of Radio Nepal and its management system becomes larger, and also its role as a mass-media in Nepal will become more and more important.

In accordance with this expansion, nearly 80 personnel are needed and the scale of its annual budget must be increased.

Fortunately, the annual budget of Radio Nepal has been increasing year by year, so that the future expansion and development of broadcasting in Nepal are expected.

Kathmandu Studio, Kathmandu Transmitting Station and Pokhara Broadcasting Station were completed by the grant aid cooperation in 1983, and these facilities have been well-maintained and operated and the staff's effort can be highly estimated.

In the meantime, the diffusion number of radio sets has reached about 70% of the entire households. It can be seen that people are listening to the short-wave broadcasting where medium wave is not yet available, which represents a strong desire of the people for radio broadcasting.

Necessity and validity of this Project can be fully proved from the sincere attitude of HMG of Nepal toward this Project, diffusion of radio sets, and contribution to realization of various development programmes and educational information to be given by expanding the service areas.

CHAPTER 5 CONCLUSION AND RECOMMENDATIONS

CHAPTER 5 CONCLUSION AND RECOMMENDATIONS

5-1. Conclusion

The request from HMG of Nepal this time (Phase II) envisaged that broadcasting stations be newly installed in nine areas throughout the country (Surkhet, Dhankuta, Dipayal, Dhalkebar, Butwal, Ramechhap, Gorkha, Ghorahi and Jumla) aiming at development of the nationwide medium wave broadcasting network.

It came to a conclusion that the following four areas would be appropriate as the locations of the broadcasting stations by analyzing the field survey results in view of necessity for establishment of the stations, problems related to construction work, benefits expected upon completion, etc.

- (1) Surkhet: This is the centre city in Mid-Western Development Region. If a 100kW broadcasting station is constructed here, about 2.05 million people will be covered.

Commercial electric power will be supplied by June 1989 and the road to Surkhet will be completed by the end of 1988, hence there will be no problem in construction work.

- (2) Dhankuta: This is the centre city in Eastern Development Region, and Terai Plain lies south of Dhankuta. In this Plain there are cities such as Dharan and Biratnagar around which the only industrial zone in Nepal exists. Dhankuta, however, is a city developed in the mountaineous area as high as 1300 to 1700 metres and there are full of sharp ups and downs. Therefore, it seems very difficult for Dhankuta to secure enough space for construction of a medium wave broadcasting station, thus the plan was made to locate only the studio in the city of Dhankuta and the transmitting station in the city of Dharan about 23km south of Dhankuta in the Terai Plain. By international agreement, the country concerned (India in this case) should agree to the above and the International Telecommunication Union (ITU) should grant

the above. It is necessary for the Nepalese side to perform the formalities.

About 3.67 million people will be covered by a 100kW station if it is constructed in Dharan. Commercial electric power and roads are already available, thus there are no problems in construction work. Telephone relay link for programme transmission is already established between Dharan and Dhankuta, and so only the terminal equipment has to be installed.

- (3) Dipayal: This is in an important position as the centre city in Far Western Development Region. About 560,000 people will be covered if a 10kW station is constructed here.

Neither electric power nor roads are available yet, but commercial power by a fuel oil generator will be prepared by Jun 1990. A road between Dhangadhi, a town close to the border with India, and Dandel dhura will be completed by May 1989. There is a plan to pave a road between Dandel dhura and Dipayal but material transportation in the rainy season should be avoided.

Telephone relay link is now under construction between Nepalganj and Dipayal, thus presenting no problems in programme transmission.

- (4) Dhalkebar: This is a town along a main road running east and west in the Terai Plain, and in a densely populated area including Janakpur south of Dhalkebar. No electric waves can reach here from the existing Kathmandu Station or from a new Dhankuta Station. About 1.43 million people will be covered by a 10kW broadcasting station if constructed.

Both electric power and roads are available and VHF transmission relay link will be constructed from Janakpur to this site for programme transmission.

With the completion of these four broadcasting stations, the medium wave broadcasting coverage will reach more than 90% of the entire population together with Kathmandu and Pokhara Stations.

This figure is based on the service area of a field strength at 60dB μ V/m or more, but it will be actually possible for the whole people to listen to the MW service even in areas of the field strength lower than the above because of less electric interference in rural areas.

Radio Nepal, the executing agency on the Nepalese side, has well-established organization, administration and an operating system, and the facilities of both Kathmandu Station and Pokhara Station constructed in Phase 1 have been kept in a very good condition in terms of maintenance and administration. Therefore, no problems appear in operation after completion of this Project both technically and financially.

5-2. Recommendations

5-2-1 Recommendations for Commencement of this Project

This Project aims to establish medium wave broadcasting stations in four areas of Nepal, and to cover the whole country by the medium wave network, although electric power is not supplied yet to the two areas: Surkhet and Dipayal (transmission line not installed yet).

For example, 400~500kVA is required for operating a set of 100kW transmitting equipment at a medium wave broadcasting station. Enormous plant & equipment investment and working funds are required if the above power is supplied by standby generators, and their fuel supply will be also a big problem. Therefore, it is necessary to confirm in advance if the power supply is possible to Surkhet and Dipayal. Nepal Electricity Authority (NEA) responsible for power supply in Nepal assured the team that the electric power for Surkhet station would be supplied by June, 1989, and for Dipayal station it would be provided by June 1990.

This applies also to the programme relay link. Most of the programmes to be broadcasted from various stations in the country after completion of this Project are transmitted to each station from Kathmandu Station through a relay link. NTC (Nepal Telecommunication Corporation) network will be used for this relay link, and the link with grades higher than telephone links is required. According to the NTC network plan, a digital radio relay link will be used in some portions between Kathmandu and Surkhet and Dipayal, thus resulting in different link configurations and different technical specifications depending on the sites transmitted. It is also necessary that a radio relay link should be prepared from the NTC dependent exchange to the station site of Dhalkebar, and it is necessary that Radio Nepal and NTC should fully discuss and coordinate the link configurations.

Nepal is a landlocked country, and the materials and equipment shipped from Japan will all be off-loaded in India and transported overland to Nepal across the international borders. It is thus desired that various formalities for customs clearance and overland transportation at disembarkation ports and the border be smoothly performed by close coordination with India.

5-2-2 Various Problems after Completion of this Project

With the completion of this Project, four broadcasting stations will come into operation in local cities.

The staff required for engineering, programme and news editing are estimated about 80 all together for the four stations. These staff will be either newly recruited or transferred from the existing stations, thus a thorough preparation for securing the staff and training should be made.

It is of great significance in view of programming that with the completion of this Project a broadcasting station is located in each centre city of Development Region throughout the country. Coverage by medium wave broadcasting will be expanded immediately to rural and mountainous areas nationwide, and it will be possible to produce and broadcast programmes that reflect the real character of each local area.

Programmes of Radio Nepal are all national programmes sent out from Kathmandu Station, but it will be possible to contribute to local development by editing local programmes and by providing educational materials and local information closely related to the local region.

Radio Nepal has a plan to start FM broadcasting in the future, and wishes to diversify their programmes in order to meet the needs of listeners. Thus we understand the necessity for a new medium - FM broadcasting. Presently, Radio Nepal has been broadcasting the same programmes on two short-wave frequencies,

3230kHz and 5005kHz, and on the medium wave. The role played by SW broadcasting has been great in view of servicing national programmes throughout the country, but it is necessary to review the roles played by three waves - MW, SW and FM on the occasion of completion of the MW broadcasting network.

Each wave medium can be categorized by programme as follows:

Medium Wave : domestic national service
Short Wave : overseas broadcasting service
FM : limited local service such as music
with its improved quality

Radio Nepal should study and review future programming.

Problems related to the future FM service involve the relation with TV broadcasting.

VHF is used as FM broadcasting wave, and the propagation characteristics of FM wave are almost the same as those of TV wave in VHF band. Some of the transmitting equipment such as a transmitting mast and antenna can be used for both TV and FM. In addition, broadcasting facility sites should be the same for both TV and FM considering the future broadcasting network.

Presently, Radio Nepal is responsible for radio broadcasting and Nepal Television (NTV) for TV broadcasting, and close coordination is required between these two bodies. It might be worth considering that these two be merged into one.